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(*including* MILK AND FOOD SANITATION)

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Editorials

The opinions and ideas expressed in papers and editorials are those of the respective authors. The expressions of the Association are completely recorded in the transactions.

SANITARIANS AND ENGINEERS

MILK and food sanitarians are engaged primarily in quality supervision and sanitary technology. Sanitary engineers are concerned primarily with constructive and operative procedures in effecting correction and production. Related? Yes. So is medicine and dentistry. So is animal husbandry and veterinary medicine. However, everyone knows that each of these fields has an outlook that characterizes it apart from all others. One of them takes up a public service where the other leaves off.

Sanitarians are increasingly recognizing that they are the trail-blazers in opening up fields for the sanitary engineers to develop and correct. [See editorial, this JOURNAL, p. 127, (1945).] Potentially they should constitute a professional entity, a group that is recognized as such—analogous to the food technologists who constitute the Institute of Food Technologists. So we again bespeak that sanitarians take themselves seriously, formulate educational qualifications, steer clear of unionizing and other non-professional tendencies, and be wary of losing their identity by becoming part of the Engineering Section of the A.P.H.A. Collaborate—yes. Amalgamate—no. A national institute of sanitarians (see editorial in this JOURNAL, May–June issue, page 129) might well be sponsored by the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., at its coming Annual Meeting. Your (you, reader) ideas would be welcome. Is anybody interested?—or are we on the wrong track?

J. H. S.

RESEARCH ON THE MOVE

So much "research" is geared to low ceilings that we note with interest the action of the National Research Council in inaugurating a comprehensive study "to determine precisely what requirements are being enforced in representative jurisdictions and how the requirements affect the quality of milk delivered to the consumer." (See full statement, this JOURNAL, page 303.) Maybe now we can get some *facts* to replace notions as the basis for regulatory and supervisory procedures.

We commend this endeavor. It shows that somebody is thinking. We observe that the scope of the study is confined to milk-handling from farm *to* consumer. We realize that the evaluation of present practices and the disentanglement of prejudice from knowledge will require all the resources of the distinguished group who man the project. However, we are impelled to point out two additional lines that need study.

In the first place, we see in the Report of the Commitee on Ice Cream (this JOURNAL, page 290) that the consumption of ice cream in some areas has increased greatly, and that distribution is greatly expanding. The ice cream industry is certainly on the move.

What's new in milk? Nothing.

In the second place, a correspondent, our friend Sam Abraham, writes: "Your . . . editorial brought to mind a long-standing curiosity which I have regarding the sanitary quality of milk as it is consumed in the home. . . . Regulatory officials are doing a great deal of work to determine the bacteriological quality of milk as delivered by producers and after processing at pasteurizing plants. Few of the agencies take a limited number of samples at grocery stores or from vehicles of dealers. Our main emphasis has been and still is on inspection of dairies and milk plants and on the education of the operators. This, of course, is desirable. But, should not we also be concerned with the handling of milk in the many thousands of homes in the congested tenement houses of large industrial centers, where, even today, few electric refrigerators are available? What is the total count on *B. coli* content of milk consumed by children in these homes? What is the need for education here? Do we know? Is there a significant difference in quality of milk in the homes, let us say, on Park and Fifth Avenues, New York City, and that in Harlem and other low income areas? Would it not be worth while to spend at least a small portion of our control time and effort on a survey of this type so that we may have some real data? And would not the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS and the JOURNAL be in the best position to stimulate and coordinate work of this type?"

Of course we all *think* that we have the answer. Maybe. What are the facts?—and something that is equally important: what new developments, not now anticipated, would come out of an investigation which is down so close to where people live? Control practices! Markets! Public health!

J. H. S.

"BIOLOGICAL ILLITERACY"

AT THE recent conference held under the auspices of the National Sanitation Foundation, Dr. Haven Emerson quoted this expression—"biological illiteracy"—coined by his son, Dr. Ralph Emerson, Assistant Professor of Botany at the University of California. This phrase speaks volumes.

The public is informed on a lot of things. A glance over the headlines of the daily press reveals the breadth of the public interest. Newspapers, weeklies, books—all are written to cater to the demand of a market that is willing to pay huge sums to learn what is going on—the world news. What proportion of it deals with the broad subject of health?

There are several fields which reveal a good beginning in awakening the public consciousness. First, there are the sports—important in their health value even though pursued from a different motivation. Then, there is the increasing recognition of the importance of incorporating a large proportion of dairy products in the diet. This development is largely the result of the educational work done in the public schools by the National Dairy Council, based on the findings and teachings of men like McCollum, Sherman, and others.

The public is becoming increasingly aware of the significance of other factors in its environment—slum clearance, housing, good housekeeping, fresh air, recreation, adequate nutrition, preventive medicine, and many more. Sanitation is one of the latest to arrive. Unfortunately, this field does not have the objective appeal that makes the subject one that the public can readily visualize and

understand. Every one is repulsed by a slum neighborhood and foul air. Only a relatively few persons possess a background of knowledge that makes possible an effective program of sanitation. For example, many a person knows that he should cover his mouth when he coughs, so he puts his hand over his mouth (as custom dictates) and then proceeds with shaking your hand or wrapping your food. Many comply with the drill regulations but don't know why. They are biologically illiterate.

A good beginning has been made in creating an awareness in this field. Clean restaurants, pure water, individual drinking cups, pasteurized milk—all these are receiving increased attention. Some other areas are not, as for example, the average eating establishment (especially the soda fountain), the bakery counter, the point-of-sale servicing of ice cream, the dressing of meat under non-federal (non)inspection, the mediaeval handling of poultry (alive and dressed), seafood handling, etc., etc. Then too, behold the doings in the barber and beauty shops, the "rest rooms", cigar factories, industrial plants in general, and *et cetera* some more.

Why don't people see these things? We may cite two reasons: they have not the knowledge that enables them to recognize the gross insanitation, and they have not been missionary-ized—no one has told them. They are biologically illiterate and don't know it.

The National Sanitation Foundation has drawn up a useful credo:

"Sanitation is a way of life."

This means that the condition of sanitation is brought about by an instinctive application of biological and physical principles for safeguarding the environment in the interest of health. It means that the person is so well grounded in understanding the effects of environmental conditions on his well-being that he instinctively conducts himself so as to avoid violating these principles. Sneezing in a crowd would then be avoided as naturally as looking now up and down the street before stepping off a curb.

As said above, a good start has been made. The agents are primarily the official governmental agencies in the federal, state, and municipal services, supported by some leading civic and industrial groups. What is needed particularly is an authoritative, professional organization which lives with these problems, develops the long look, assembles and distributes informative material, devises educational stimuli, works out the effective "know how", and generally catalyzes the program. In other words, there is needed in the field of sanitation a job which the National Sanitation Foundation can do broadly and intensively like the National Dairy Council has done in the education of the public as to the need for the use of dairy products. In an ill-defined sense, the public likes cleanliness and attractiveness and healthfulness—like all children want to be great writers and great teachers and great doctors and great engineers. Then teach them.

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J. H. S.

PROPOSED CHANGES IN THE CONSTITUTION

CHANGE is not necessary for one group of people—dead ones. The fact of growth means change, and the same truth applies to organizations. Again, the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., is finding that it has outgrown the constitutional setup which was adequate in its yesterdays.

The great growth in public consciousness of the need for pure and clean food, and the response of industry to meet this demand has resulted in a con-

tinuing increase in the number of persons who are employed in this field, both official and also industrial. Nowadays commercial firms contribute about as much to milk and food sanitation as do official and educational institutions. These men are professional, well trained, interested, ethical, and cooperative. Some of us think that the basis of membership in this Association should be broadened to enable such men to become an integral part of this great body of organized milk and food sanitarians. From the experience of our annual meetings of many years, we know that our programs are as scientifically unbiased and technologically sound and stimulating as they ever were, to say the least. Half of our papers are presented by industrial men. We think that they should be part of us. Membership should be open to officials and industry alike.

Then too the interest and activity of sectional or area affiliate groups demands a closer tie-in to the development of the parent International Association. Only a small percentage of the total membership can attend each of the annual meetings as these are moved about over the country. But all the members are concerned in what the Association does because it represents their interests. They should have more "say" in formulating its policies and developing its program. To meet this need, a Council is provided consisting of representatives from each Affiliate section. This Council will in general advise with the Executive Board in developing the work of the parent Association and specifically will administer the Affiliate program under the general authority of the Executive Board.

A new class of Sustaining members allows industrial firms to help carry on this work at $25 per member. Each firm is entitled to receive the JOURNAL and be represented in all affairs of the Association by an Active member of its choice.

In general, these are the main changes that are proposed. Minor ones define quorums, list duties of officers, specify administrative functioning, and rearrange the structure of the Constitution whereby the fundamental provisions are briefly specified therein and the details follow in the expanded By-Laws.

In accordance with the requirements of the Constitution, the Secretary-Treasurer will present a copy of the proposed amendments to the Active membership for vote.

J. H. S.

Detroit Civil Service Examination

JUNIOR VETERINARIAN.....**Salary:** $3034 to $3434 per year
SENIOR VETERINARIAN.....**Salary:** $3591 to $4068 per year
EXAMINATION DATE: Daily, commencing July 18, 1949
FILING PERIOD: July 5, 1949 to October 17, 1949 and for three months thereafter.
RESIDENCE RULE WAIVED
VACANCIES: To establish an eligible register

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LABORATORY EVALUATION OF CLEANER-SANITIZERS FOR USE ON DAIRY FARMS *

FRANKLIN W. BARBER

National Dairy Research Laboratories, Inc., Oakdale, Long Island, New York

THE cleaning and sanitizing of milking equipment on the dairy farm is one of the most important steps in the production of high quality milk. Many studies are being made in attempts to improve present methods and to make easier the farmer's laborious task of cleaning milking equipment. Recently, reports have appeared in the literature concerning the use of detergents on the dairy farm as a one solution product in which thorough cleaning and rinsing of equipment replaces the older method of cleaning and sanitizing equipment by the use of two different compounds. Another product of this type which has received some attention is a cleaner-sanitizer compound, a mixture of a non-ionic wetting agent, a quaternary ammonium compound, and other inert ingredients, which cleans and sanitizes in one operation.

The proper utilization of cleaner-sanitizer compounds on the dairy farm can be of value to the dairy farmer. Laboratory evaluation of a cleaner-sanitizer is essential in aiding the farmer to select the best possible product for use on his farm. The effect of water hardness, residual organic matter, and temperature of solutions on the cleaning and sanitizing properties of the compound must be evaluated as well as the effect of the compound on equipment, the cow's udder, and the hands of the farmer.

In our laboratory, methods of testing were developed which make possible the laboratory evaluation of cleaner-sanitizer compounds under conditions closely approximating those unfavorable conditions which may occur in actual practice.

METHOD

The oval-tube method for testing cleaner-sanitizer compounds is the determination, under controlled conditions, of the time required to obtain 99.9 percent destruction of the test organism by a known concentration of the sanitizing agent in the presence of added organic matter. The method is based on a modified agar plate colony count procedure in which the number of organisms surviving various exposures to a sanitizing agent is determined by colony counts on oval-tube slants.

The test organism selected is a heat resistant culture of *Escherichia coli*, which has been shown by preliminary tests to be decidedly resistant to the action of quaternary ammonium compounds. Ice cream mix was selected as the added organic matter inasmuch as its composition was fairly uniform from sample to sample and its effect on the bactericidal efficiency of the sanitizing compounds was somewhat greater than that of whole milk.

In an attempt to approach the most unfavorable conditions which may be found in actual practice, the test conditions are made as adverse as possible. The test temperature is kept between 20° and 25° C.; synthetic hard water (30 grains per gallon calcium hard-

* Invited paper for presentation at the Dairy Technology Section of the annual meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., at Philadelphia, Pa., October 21–23, 1948.

ness) is used as a diluent in test solutions (comparative tests were also made with soft water and distilled water); and increasing amounts of ice cream mix (0.1, 0.5, 1.0 and 2.5 percent) are added to build up organic contamination. The pH of test solutions is determined but not controlled. Concentrations of the germicides are those recommended by the manufacturer, usually 200 p.p.m. of active ingredient.

Briefly, the operation of the test is as follows: A test organism suspension is prepared with sterile distilled water from a 24 hour agar slant culture. The suspension is shaken thoroughly and filtered through sterile filter paper. Ten ml. of test solution (made up of 8 ml. of the desired testing water, 1 ml. of 10X concentration of ice cream mix, and 1 ml. of 10X concentration of cleaner-sanitizer solution) placed in a sterile one inch test tube, is inoculated with 0.1 ml. of filtered culture suspension giving a test solution bacterial count of between 10 million and 100 million per ml. Subtransfers with 0.001 ml. calibrated loop are made at the desired time intervals into oval tubes containing 4–5 ml. of melted agar. The seeded agar is mixed gently but thoroughly and slanted immediately. After the agar has solidified, the tubes are inverted and incubated. (Figures 1, 2, and 3.)

FIG. 1. An oval tube containing agar medium.

FIG. 2. The subtransfer from test solution tube to oval tube of melted agar medium.

FIG. 3. A series of oval tubes showing from left to right: control #1, three tubes of control #2, three tubes of control #3, and four subtransfers showing a decrease in colonies from TNTC to none.

Three sets of controls are prepared for each series of tests: (1) an oval tube of melted agar inoculated with a 0.001 ml. loopful of test solution, before seeding, to detect the presence of contaminating organisms in the test solutions; (2) three oval tubes to which are added first a loopful of test solution and then a loopful of the proper dilution of culture suspension, to detect any bacteriostatic action of the test solution carried over by the subtransfer; and (3) three oval tubes inoculated with a 0.001 loopful of the proper dilution of the culture suspension to obtain a colony count of the inoculum.

After incubation, colonies are counted on all tubes having 100 colonies or less (Figures 4 and 5). Using the count on control No. 3 and the counts on the subtransfer tubes, the test end-point is determined. The end-point is the time required for destruction of 99.9 percent of the organisms present at the start of the test.

FIG. 4. An uncountable oval tube (TNTC or >100).

FIG. 5. A countable oval tube.

EXPERIMENTAL RESULTS

A large part of the work done in our laboratory has been the evaluation of various sterilizing agents, particularly the quaternary ammonium compounds. The evaluation of cleaner-sanitizers has been a more recent development. Methods and conditions developed for studying high concentrations of sterilizing agents (100–200 p.p.m. active ingredient) have proven applicable to those cleaner-sanitizers. It has been found that the bactericidal effectiveness of most of the quaternary cleaner-sanitizers follows closely the bactericidal effectiveness of the proprietary active ingredient. Hence, much of the information obtained on quaternary ammonium compounds alone is applicable to quaternary cleaner-sanitizers. However, the so-called inert ingredients present in the quaternary cleaner-sanitizer also affect the bactericidal properties of the compound, making laboratory evaluation of each compound

TABLE 1

EFFECT OF TYPE AND AMOUNT OF ADDED ORGANIC MATTER ON THE KILLING-TIME FOR CONCENTRATIONS OF 100 AND 200 P.P.M. OF QUATERNARY AMMONIUM COMPOUND *

Conc. of germicide	*Conc. of added organic matter*	*Killing time*			
		Skim milk	Whole milk	Ice cream mix	Sw. cond. whole milk
p.p.m.	percent	min.	min.	min.	min.
100	0.0	½	½	½	½
	0.1	2	5	5	12
	0.5	10	22	18	30
	1.0	18	>44	40–45	>60
	2.5	>60	>60	>60	>60
200	0.0	<½	<½	<½	<½
	0.1	<1	1	1	2
	0.5	2	3	3	8
	1.0	3	6	7	>24
	2.5	12	>34	40–45	>60

* An alkyl-dimethyl-benzyl ammonium chloride
Test organism—*E. coli*
Test temp.——20–25° C.

essential. To understand better the need for careful laboratory evaluation of any sterilizing agent or cleaner-sanitizer compound, a brief discussion of the effects of organic matter, water hardness, and temperature is included in this report.

The amount and kind of organic matter present affects the bactericidal effectiveness of sterilizing agents. The data summarized in Table 1 and Figure 6, although actually data on an alkyl-dimethyl-benzyl ammonium chloride, are typical for quaternary cleaner-sanitizers and show that increases in the amount of organic matter increase the exposure time necessary to obtain 99.9 percent destruction of the test organism. Also listed in the order of effect from least to greatest, are skim milk, raw whole milk, ice cream, and sweetened condensed milk.

FIGURE 6

Effect of type and amount of added organic matter on killing-time for 200 ppm of quaternary.

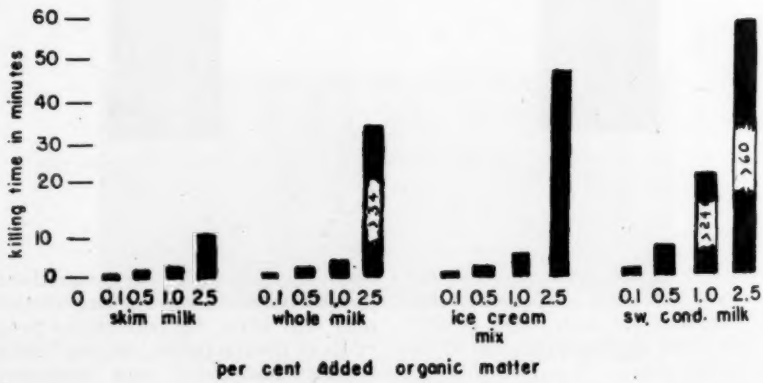


TABLE 2

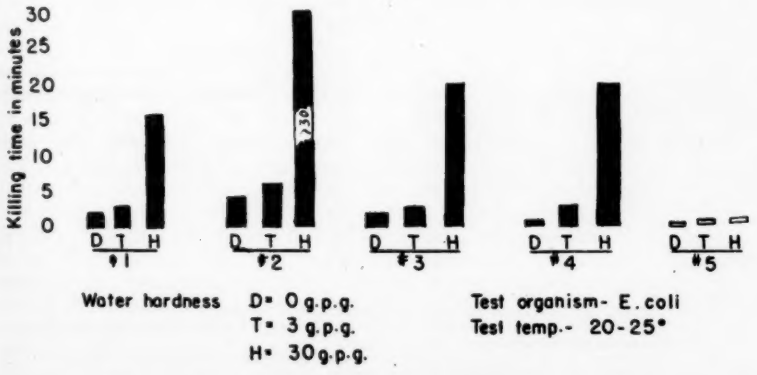
COMPARISONS OF THE EFFECT OF WATERS OF 0, 3, AND 30 G.P.G. HARDNESS ON THE KILLING-TIME OF FIVE GERMICIDES AT 200 P.P.M. CONCENTRATION WITH AND WITHOUT ADDED ICE CREAM MIX

		Killing-time				
Diluent	*Conc. of added ice cream mix*	Q.A.C. No. 1	Q.A.C. No. 2	Q.A.C. No. 3	Q.A.C. No. 4	Hypo-chlorite No. 5
	percent	min.	min.	min.	min.	min.
Distilled H_2O	0.0	<½	<½	<½	<½	<½
0 g.p.g.	0.1	<1	<1	<½	<½	<½
	0.5	2	5	2	1	<½
	1.0	4–6	15–30	6–8	4	½
	2.5	>60	>60	>60	10–20	30–40
Tap H_2O	0.0	<½	<½	<½	1	<½
3 g.p.g.	0.1	1	3	<1	2	<1
	0.5	3	6	3	3	<1
	1.0	7	20–30	5–15	5–10	1
	2.5	40–45	>60	45–60	>60	>60
Synthetic hard H_2O	0.0	3	10	>10	7	<½
	0.1	2–4	>10	2	12–14	<½
30 g.p.g.	0.5	16	>30	20	20	<½
	1.0	10–20	>60	20–30	10–20	<1
	2.5	20–30	>60	>60	10–20	>30

Key: Q.A.C. No. 1—alkyl-dimethyl-benzyl ammonium chlorides
Q.A.C. No. 2—di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl benzyl ammonium chloride
Q.A.C. No. 3—alkyl-dimethyl-ethyl ammonium bromides
Q.A.C. No. 4—lauryl pyridnium chloride
No. 5—hypochlorite—Na hypochlorite plus alkaline Na phosphate
Test organism—*E. coli*
Test temp.—20–25° C.

FIGURE 7

Effect of waters of 0, 3, and 30 g.p.g. hardness in the presence of 0.5% ice cream mix on the killing-time of five germicides at 200ppm concentration.



Typical results on the effect of water hardness are summarized in Table 2 and Figure 7. In the absence of organic matter, there is little difference between distilled water and water of 3 g.p.g. (grains per gallon) hardness but with water of 30 g.p.g. hardness there is a marked increase in killing time. The addition of organic matter brings about a greater increase in killing time by the quaternary ammonium compounds for both low and high hardness waters. However, it would appear that some quaternaries are not affected as adversely as others. When using a gram-negative test organism, hypochlorites apparently are not affected by water hardness (up to 30 g.p.g. hardness) or organic matter until the percentage of organic matter is over 1 percent.

The effect of increasing the test temperature is summarized in Table 3 and Figure 8. Five compounds were tested at 20°–25° C. and 37° C. Of the cleaner-sanitizers one compound is greatly improved at the higher temperature, one compound is improved slightly, and one not at all. One quaternary ammonium compound also is improved while the other shows only slight improvement at 37° C.

The results presented so far have been an evaluation of various compounds against a gram-negative organism, an extremely resistant test organism. In actual practice, many of the organisms to be destroyed are gram-positive cocci, perhaps the most important of which are the thermodurics micrococci. A comparative study was made using a quaternary cleaner-sanitizer and a hypochlorite and both gram-negative and gram-positive test organisms in waters of 3 and 30 g.p.g. hardness. The results summarized in Table 4 and Figure 9 show the quaternary cleaner-sanitizer compound to be much more effective against gram-positive test organisms than against the gram-negative test organism. On the other hand, the hypochlorite is decidedly more effective against the gram-negative test organism than against the gram-positive test organisms. These results would indicate that the cleaner-sanitizer compounds in which the active ingredient is a quaternary ammonium compound may be much better sanitiz-

TABLE 3

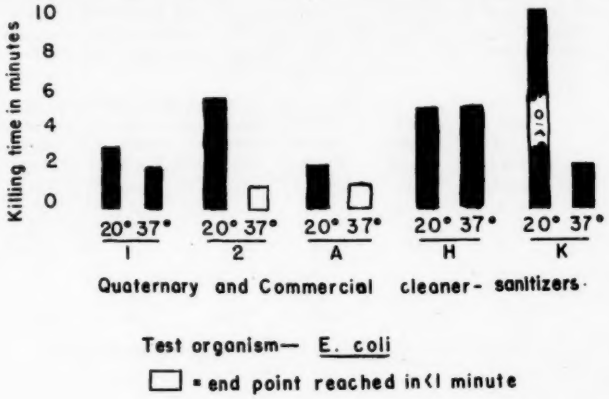
EFFECT OF TEST TEMPERATURE ON THE KILLING TIME OF SEVERAL COMMERCIAL CLEANER-SANITIZERS AND QUATERNARY AMMONIUM COMPOUNDS AT CONCENTRATIONS OF 200 P.P.M. IN WATER OF 3 G.P.G. HARDNESS WITH ADDED ICE CREAM MIX

Conc. of added ice cream mix	*Test temp.*	*Killing time*				
		Q.A.C. No. 1	Q.A.C. No. 2	Sanitizer A	Sanitizer H	Sanitizer K
percent	° C.	min.	min.	min.	min.	min.
0	20–25	½	½	<½	7	>5
	37	½	2	<½	<5	1
0.5	20–25	3	6	2	5	>10
	37	2	<1	<1	5	2
2.5	20–25	40–45	60	10	11	>30
	37	10–20	50–60	<6	<10	5

Key: *Quaternary ammonium compound*
Q.A.C. No. 1—alkyl-dimethyl-benzyl ammonium chlorides
Q.A.C. No. 2—di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl ammonium chloride
Commercial cleaner-sanitizer active ingredient
Sanitizer A—di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl ammonium chloride
Sanitizer H—alkyl-dimethyl-ethyl-ammonium bromide
Sanitizer K—silver polyphosphate

Test organism—*E. coli*

FIG. 8. Effect of test temperature on the killing-time of several commercial cleaner sanitizers and quaternary compounds at 200 p.p.m. concentrations in water of 3 g.p.g. hardness with 0.5 percent added ice cream mix.



ing agents in controlling thermoduric organisms than are the hypochlorites.

Representative samples of numerous cleaner-sanitizer compounds were obtained for bacteriological evaluation. Results obtained with seven representative compounds using water of 3 g.p.g. hardness and added ice cream mix are summarized in Table 5 and Figure 10. Considerable variation is noted between these compounds, some giving much better results than others. When these same compounds are tested with water of 30 g.p.g. hardness, the difference between compounds is even more marked.

Several experimental quaternary cleaner-sanitizer compounds from different sources were available for bactericidal tests. These compounds were compared with commercial compounds containing the same active ingredient using a test procedure with water of 30 g.p.g. hardness and increasing amounts of ice cream mix. Results summarized in Table 6 and Figure 11 show that the composition of some of these compounds evidently is such that the adverse effects of hard water and organic matter are overcome and good bactericidal results are obtained even in the presence of 2.5 percent ice cream mix.

Laboratory evaluation has shown that the quaternary cleaner-sanitizer compounds can give satisfactory bactericidal results in hard water and in the presence of added organic matter. Several field tests have been started from which complete results are not available at this time. However, it can be stated that the field results correlate very well with results obtained in the laboratory.

In one field test, the writer had the opportunity of observing and talking with a number of the farmers concerned. In practically every instance, the farmer was pleased with the quaternary cleaner-sanitizer. Some stated that the products cleaned the cow's udder very well and were not "harsh" on the udder or the farmer's hands. Observations of milk pails and milking machines showed that there was no film formation and that the equipment was in satisfactory condition.

SUMMARY

A laboratory method has been presented for evaluating cleaner-sanitizer

TABLE 4

COMPARISON OF THE BACTERICIDAL EFFECTIVENESS OF A QUATERNARY AMMONIUM COMPOUND AND A HYPOCHLORITE AT 200 P.P.M. CONCENTRATION ON GRAM NEGATIVE *(E. coli)* AND GRAM POSITIVE *(Staph. Aureus** AND *M. Freudenreichii)* ORGANISMS IN WATERS OF 3 AND 30 G.P.G. HARDNESS IN THE PRESENCE OF ICE CREAM MIX

		E. coli		*Staph. aureus**		*M. freudenreichii*	
Germicide	*Conc. of added ice cream mix*	water 3 g.p.g.	water 30 g.p.g.	water 3 g.p.g.	water 30 g.p.g.	water 3 g.p.g.	water 30 g.p.g.
	percent	min.	min.	min.	min.	min.	min.
Q.A.C.	0.0	<½	10	<1	<½	<½	<½
	0.5	6	>30	<1	<1	<½	<½
	2.5	>60	>60	<10	<1	1	<½
Hypochlorite	0.0	<½	<½	2	2	1	<½
	0.5	<½	<½	>8	>8	>5	>5
	2.5	>60	>30	>10	>10	>60	>30

Key: Q.A.C.—di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl ammonium chloride
Hypochlorite—sodium hypochlorite
Test Temp.—20–25° C.
* Now *Micrococcus pyogenes var. aureus*

FIG. 9. Comparison of the bactericidal effectiveness of a quaternary compound and a hypochlorite on gram negative *(E. coli)* and gram positive *(Staph. aureus* and *M. freudenreichii)* organisms in water of 3 and 30 g.p.g. hardness in the presence of 0.5 percent ice cream mix.

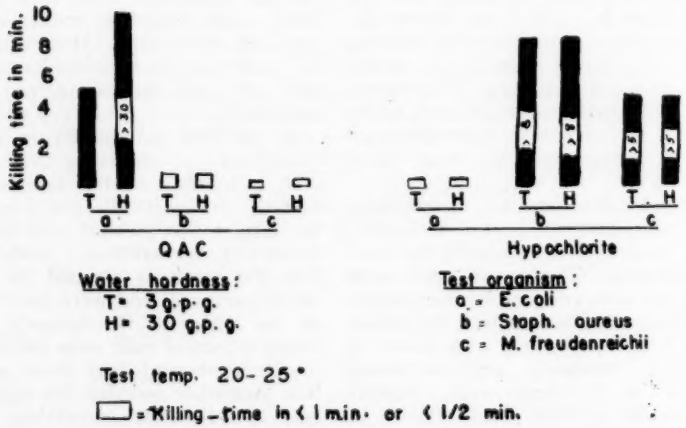


TABLE 5

KILLING TIME OF SEVEN COMMERCIAL CLEANER-SANITIZER COMPOUNDS AT RECOMMENDED CONCENTRATION IN 3 GRAIN HARDNESS WATER IN THE PRESENCE OF 0.5 PERCENT ICE CREAM MIX

Code	*Active ingredient*	*Killing time* min.
D	Q.A.C. plus non-ionic wetting agent	>45
E	alkyl-dimethyl-ethyl ammonium bromides	4
G	alkyl-dimethyl-benzyl ammonium chlorides	6
H	alkyl-dimethyl-ethyl ammonium bromides	5
I	di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl-benzyl ammonium chloride	<2
J	alkyl-dimethyl-benzyl ammonium chlorides	<1
K	silver polyphosphate	>10

Test organism—*E. coli*
Test temp.—20–25° C.

compounds. This method is based upon the adverse effects of temperature, water "hardness," and organic matter on the bactericidal action of quaternary ammonium compounds. The method permits laboratory testing of sanitizing compounds in concentrations recommended for use by the manufacturers under conditions closely approximating those unfavorable conditions which may occur in actual practice. Preliminary field test evaluations of several cleaner-sanitizer compounds have shown close agreement with evaluations obtained with this laboratory testing procedure.

FIG. 10. Kjlling-time of seven commercial cleaner-sanitizer compounds at recommended concentration in water of 3 g.p.g. hardness in the presence of 0.5 percent ice cream mix.

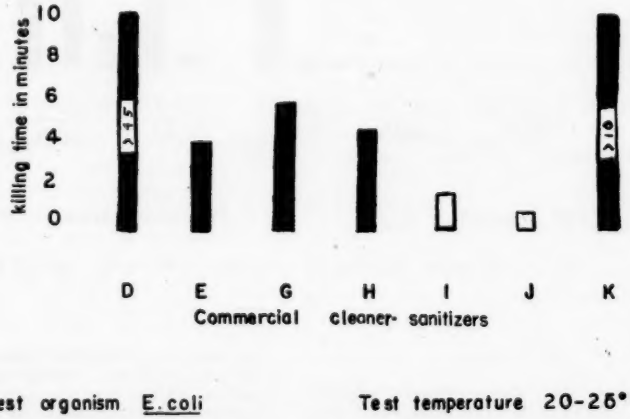


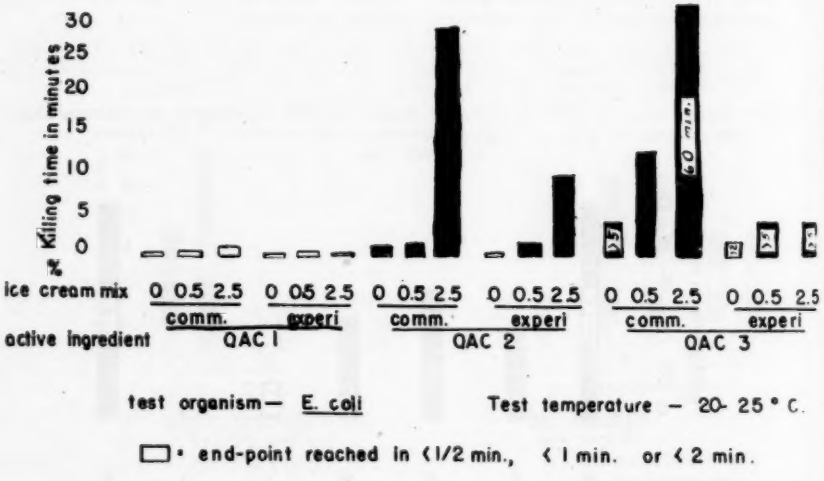
TABLE 6

COMPARISONS OF THE KILLING TIME OF COMMERCIAL AND EXPERIMENTAL CLEANER-SANITIZER COMPOUNDS AT A CONCENTRATION OF 200 P.P.M. IN WATER OF 30 G.P.G. HARDNESS AND IN THE PRESENCE OF ADDED ICE CREAM MIX

	Killing Time					
Conc. of added ice cream mix	Q.A.C. No. 1		Q.A.C. No. 2		Q.A.C. No. 3	
	Comm.	Experi.	Comm.	Experi.	Comm.	Experi.
percent	min.	min.	min.	min.	min.	min.
0.0	<½	<½	1½	½	>5	>2
0.5	<1	<½	2	2	14	>5
2.5	<2	<½	30	10	60	>5

Key: Active Ingredient
Q.A.C. No. 1—alkyl-dimethyl-benzyl ammonium chlorides
Q.A.C. No. 2—di-isobutyl-phenoxy-ethoxy-ethyl-dimethyl benzyl ammonium chloride
Q.A.C. No. 3—alkyl-dimethyl-ethyl ammonium bromides
Test organism—*E. coli*
Test temp.—20–25° C.

FIG. 11. Comparisons of killing-time of commercial and experimental cleaner-sanitizer compounds at a concentration of 200 p.p.m. in water of 30 g.p.g. hardness and in the presence of added ice cream mix.


Killing time in minutes
30
25
20
15
10
5
0
60 min.
ice cream mix
0 0.5 2.5 0 0.5 2.5 0 0.5 2.5 0 0.5 2.5 0 0.5 2.5 0 0.5 2.5
comm. experi comm. experi comm. experi
active ingredient
QAC 1 QAC 2 QAC 3
test organism— E. coli
Test temperature — 20- 25 ° C.
end-point reached in < 1/2 min., < 1 min. or < 2 min.

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IS THE METHYLENE BLUE REDUCTION TEST OF ANY VALUE? *

C. K. JOHNS †
Central Experimental Farm, Ottawa, Canada

OF recent years there have been some expressions of dissatisfaction with the methylene blue reduction test. During the Symposium at the 1944 meeting of this Association, adverse opinions were expressed by several members. More recently, a prominent milk sanitarian (3) has stated that, in his opinion, the test has no place in milk enforcement work. Although Babcock doubtless had his tongue in his check when he made such an extreme statement, it will do no harm to consider whether or not such criticism is justifiable.

CRITICISMS

While there have been minor criticisms before, the more recent complaint appears to have been that samples which passed a 6-hour standard reduction time often showed plate counts far in excess of the 200,000 per ml., equivalent value established by the U. S. Public Health Service in the Standard Ordinance (21). This was most clearly indicated by the extensive results for the Chicago area reported by Abele (1).

Although the data on which these Public Health Service equivalent values were based have never been published, the values may well have held true at the time they were established, although Thornton (20) states they never held true in his area while Orla-Jensen (14) considered 5½ hours equivalent to 500,000 per ml. In any event *the original relationship between reduction times and plate counts has been severely distorted* by certain changes that have taken place during the past decade or so. First of all, as a result of the studies at Geneva, N. Y. (15), on bacteriological incubators, low plate counts due to "hot spots" have been largely eliminated. Of greater importance was the adoption in 1939 of a more adequate agar medium to replace beef peptone agar, with a consequent increase in plate count levels (4). On the other hand, increasing the dye concentration in the methylene blue test from 1 :700,000 to 1 :244,500 in 1939 (5) has prolonged the reduction time by 30 minutes or more (10, 11, 18). Finally, the greatly increased use of milking machines has resulted in more heat-resistant bacteria in milk. Most of these are weakly reducing and are not adequately reflected by the dye reduction tests, but do show up in the counting methods. Since these changes have tended to make milk appear better by the methylene blue test and poorer by the plate count, it is not to be wondered at that the former equivalent values no longer hold good.

Nearly twenty years ago, Thornton and Hastings (17) published the results of a most comprehensive study of the methylene blue test. They found that the accuracy of the test was greatest with the poorer milks and declined as quality improved. Recognizing this fact, they did not "consider the test reasonably accurate after the 5½ hour period as laid down in *Standard Methods of Milk Analysis.*" This worked no great hardship, as at that time most areas were satisfied with milk which could meet this standard.

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† Senior Bacteriologist.

Since that time, however, milk quality standards have been raised in many areas, and the old methylene blue test has been "stretched" far beyond the 5½ hour limit. When, therefore, the changes referred to in the last paragraph were made on top of this, it is no wonder that the test proved inadequate. It was being used far beyond the point where reasonable agreement between reduction times and plate counts could be expected.

EFFECTIVE MODIFICATION

If nothing could be done to bring reduction times and plate counts into closer agreement, then there would be ample justification for regarding the methylene blue test as inadequate for the better grades of milk, although still extremely useful for milks for manufacturing purposes. Fortunately, however, something *can* be done to increase its usefulness.

The chief reason why the old methylene blue test is less accurate with the better grades of milk is that variable proportions of bacteria are swept to the surface with the rising fat globules. Where bacteria are present in masses or long chains, a greater proportion will be removed than where single cells or pairs predominate. These bacteria in the cream layer are practically without influence upon the reduction of the dye in the main portion of the milk sample. If the reduction time is to reflect the activities of all the bacteria present, steps must be taken to redistribute the cream layer and the bacteria therein at intervals. The value of this modification was demonstrated by Thornton and Hastings (17) in 1930. They considered it unwise to modify the test at that time, however, feeling that the test would be most valuable as a control agent when kept as simple as possible. In England, on the other hand, G. S. Wilson and his co-workers (22) after very comprehensive studies, stressed the necessity for periodical inversion of tubes to minimize the creaming error. Their recommendation in 1935 that tubes be inverted every 30 minutes * was officially adopted by the British Ministry of Health, and in 1937 the modified methylene blue test replaced the plate count there for the examination of graded raw milks (12). More recently (13) it has also been adopted there to replace the plate count for pasteurized milk.

CONFIRMATION

Wilson's findings as to the superiority of inversion technique have been confirmed by investigators in many countries. On this continent, between 1937 and 1941 Frayer (6), Hastings (8) and Johns (9) all urged the adoption of the modified test. On the other hand, Thornton (19) the Referee for the methylene blue test for the Standard Methods Committee, argued against this step since "the possible greater accuracy of the modified test is offset by greater complexity of technic." Finally, Abele, who succeeded Thornton as Referee, became convinced as a result of his own comparative tests (1) that the modified technique should be adopted, and now, at long last, the inversion technique appears as the official method in the new Ninth Edition of *Standard Methods for the Examination of Dairy Products* (2). Had this step been taken ten years earlier, the value of the methylene blue test for market milk supplies might never have been questioned.

Contrary to Thornton's opinion, most investigators do not feel that the inversion of rackfuls of tubes at hourly intervals unduly complicates the test. In any event, the slight extra effort pays rich dividends. In addition to bringing reduction times closer into line with the equivalent plate count standards of the Standard Ordinance, investigators have found that replicate determinations show almost perfect agreement, in marked contrast to

* Johns (10) reported little difference between ½, 1 and 2 hour intervals between inversions.

the findings with the old method. Again, the dye is decolorized uniformly throughout the tube, and there is no guessing at the endpoint as with the old method. Finally, a point of considerable importance in these days of shorter working hours, reduction occurs several hours sooner with a considerable proportion of the lower count milks. The writer (9) found an average reduction time of 6 hours for the modified method for milks requiring 8 hours by the old method, while Fuchs (7) believes a 5-hour reduction time with the modified method will be equivalent to a plate count of 200,000 per ml.

USEFULNESS

Too often we tend to forget that there is no such thing as a method for assessing bacteriological quality that is 100 percent accurate. As the new 9th edition of Standard Methods (2) cogently reminds us:

"Practically all methods of determining whether samples of milk or cream conform to prescribed sanitary requirements have shortcomings of one kind or another and this is especially true of methods for determining the bacterial content. Such limitations are not serious provided they are not ignored when interpreting results of tests. Since each method depends in part upon a different principle, the variables differ both in character and in magnitude. Because each method is subject to these inherent and uncontrollable variables, both bacterial counts and reduction times should be regarded essentially as 'estimates.' . . . Implications that one method is in all cases indisputably more accurate than another are not valid."

For the testing of large numbers of samples with the minimum expenditure of time and money, the dye reduction tests have undisputed advantages. Furthermore, they indicate the poorest milks first, thus facilitating prompt corrective action. Finally, they may not only be successfully operated by less highly skilled personnel, but also, slight departures from the standard method, or lack of skill or experience, have far less influence upon the results than with the counting methods. They are admittedly less accurate than the plate count when dealing with samples in the count range of certified milks, but this is also true of the direct microscopic test, which the Public Health Service workers (16) have recently reported as being the most selective of the four tests they compared. Over wide areas, milk control has not yet advanced beyond the point where the direct microscopic and reduction test procedures are reliable. To use the much more expensive plate count method in this field would be akin to cutting down a tree with a razor instead of an ax.

Since each method has its shortcomings, it stands to reason that a combination of two or more tests is highly desirable. As the methylene blue test tells little or nothing about the types of bacteria present, the direct microscopic count should be used from time to time to aid in running down sources of high counts. Again, since none of the current methods will indicate the numbers of thermoduric bacteria present, it is desirable to run laboratory pasteurization tests at intervals. Such a combination of tests offers very complete and effective sanitary control of milk for pasteurization at a moderate cost, since the bulk of the burden is borne by the relatively simple and cheap methylene blue test.

Is the methylene blue reduction test of any value in milk control work? The facts which have been cited suggest that the answer should be strongly and unhesitatingly in the affirmative.

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SOME BIOCHEMICAL CHANGES INDUCED IN MILK BY CERTAIN SAPROPHYTIC ACTINOMYCETES

MICHAEL INVERSO* AND HARRY H. WEISER

Department of Bacteriology, Ohio State University, Columbus, Ohio

INASMUCH as *Actinomycetes* are ubiquitous, it comes as a surprise that not much has been writen regarding the biochemical effects they induce in milk. It has been stated large numbers in milk produce a turnipy and moldy flavor (Tanner, 1944).

Wakeman (1919) reported that *Actinomycetes* generally produce an alkaline reaction in milk, that they peptonize sterile litmus milk with varying degrees of rapidity, and some strains coagulate it.

REVIEW OF LITERATURE

Fellers (1922) found that *Actinomycetes* made up 2.5 percent of the microflora of samples of normal market milk he had investigated and that they made up 50 percent of the microflora of those supplies of milk which consistently developed a bitter, moldy flavor on standing.

Wakeman (1932) reported that *Actinomycetes* have produced acidity in butter.

A thermoduric strain had been isolated and characterized physiologically by Bernstein and Morton (1934) after it had been found in a cheese sample.

The growth of *Actinomycetes* is influenced by changing the pH of prepared culture medium, although in soil under natural conditions, the pH seems to have no effect upon their growth (Strikson, 1947 b). Although the optimum pH of prepared medium is 7.0 to 8.0, Wakeman (1932) found that some grew at a pH more alkaline than 9.0. Conn *et al.* (1941) stated that pigment production was a constant characteristic of certain species but that its color depended on the pH of the medium.

SOURCE OF TEST ORGANISMS AND USE OF SELECTED CULTURE MEDIA

Source of test organisms

Stock cultures of *Actinomyces griseus, Actinomyces levendulae,* obtained from the collection of the Ohio State University, Department of Bacteriology, as well as six *Actinocyces*-like microorganisms obtained from soil samples and designated as Organisms #1 to 6 respectively, were maintained on nutrient agar slants at 20–25° C. These cultures were propagated on agar slants and used in this investigation. In all cases, sterile water suspensions of the sporulated subcultures were used as inocula.

Streptococcus lactis and *Lactobacillus acidophilus* were obtained from the stock collection of the Ohio State University, Department of Bacteriology. These organisms were inoculated into 10 ml. of sterile litmus milk, and after incubation at 37° C. for 3 days, the cultures were used to inoculate flasks of sterile skim milk. The flasks were incubated at 37° for 7 days and the resulting cultures were used in the pH determinations.

Selected culture media

1. Skim milk. Sweet skim milk testing 0.01–0.03 percent butter fat was sterilized by autoclaving at 125° C. for 20 minutes. Unless otherwise indicated, the pH was not adjusted.

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* Bacteriologist, Ohio Department of Agriculture, Feeds and Fertilizer Division, Columbus, Ohio.

2. Tryptone Glucose Extract Agar (TGE Agar). Twenty-four grams of the dehydrated commercial product (Difco) were suspended in 1,000 ml. of distilled water. After melting the agar, the medium was sterilized by autoclaving at 125° C. for 20 minutes. The pH was not adjusted.

3. Krainsky's Agar. Medium #231, whose formula is found in *Compilation of Culture Media for the Cultivation of Microorganisms* (Levine and Scheshlein, 1930), was investigated in the search for a culture medium supporting good growth of saprophytic *Actinomycetes,* readily permitting their differentiation from soil *Eubacteriales* and not supporting most of the latter. Enough agar to make 2 percent was added to the medium. The pH was adjusted to 8.4 by means of NaOH. This medium was found not to inhibit saprophytic *Actinomycetes;* it influenced the development of serial spores within 3 days, and it inhibited most of the soil *Eubacteriales* that grew on TGE agar plates. The formula is: 0.3 gram NH_4Cl, 0.5 gram K_2HPO_4, 10 grams starch, 20 grams agar, 1,000 ml. distilled water. After the medium was adjusted to pH 8.4, it was sterilized by autoclaving at 125° C. for 20 minutes.

EXPERIMENTAL

The Survival and Biochemical Changes Induced in Milk by the Test Organisms:

The survival of test organisms in sterile skim milk adjusted to different pH levels.

Concentrated lactic acid was added aseptically to sterile water to make a final concentration of 8.5 percent. This solution was added to 10 ml. sterile skim milk until a pH of about 5 was attained as measured by a Coleman pH meter. With this as a basis, a quantity calculated to produce pH 5 in 300 ml. sterile milk was added aseptically to it. This flask of milk was incubated 3 days at 20–25° C. to establish its sterility. In this time casein collected in the bottom of the flask leaving about one inch of whey at the top. After sterility was apparent from microscopic examination, the flask was shaken to disperse the casein evenly and 5 ml. amounts were transferred aseptically to sterile test tubes containing 0.1 ml. of sterile distilled water suspension of spores of *Actinomyces griseus, Actinomyces levendulae,* and Organism #2. After mixing the contents of the tubes, one set of tubes was set aside to determine average pH and to furnish samples to be plated immediately. Sterile distilled water was used to make 1/1,000 dilutions of the control tubes, ½ ml. of the resulting suspensions were plated using TGE Agar, and the plates were incubated at 20–25° C. for 3 days. After 6 days at 20–25° C., the remaining samples were shaken thoroughly, and 1 ml. of each was diluted 1/1,000 and ½ ml. of the dilution was plated in the same manner as were the controls. After 3 days incubation at 20–25° C., the plates were examined for typical actinomycetes colonies.

About 10 ml. stock cultures of *Streptococcus lactis* and *Lactobacillus acidophilus* were added to separate flasks containing 300 ml. of sterile skim milk. The flasks were incubated at 37° C. for 7 days to permit acid development. At the end of that time, the flasks were agitated to resuspend the curd and several samples were removed aseptically to determine the pH. Four sterilized test tubes were labeled with the name of each organism. Then two sets of tubes were labeled with the species name *S. lactis* and the other two sets, with *L. acidophilus* to designate the milk culture to be added to them. Three drops of sterile distilled water suspension of each organism were added to the appropriate tubes, 5 ml. of milk were added and the contents of the tubes mixed. Following essentially the same procedure when lactic acid was added, one set of tubes were plated immediately and the other two sets furnished samples which were plated at the end of 6 days after being diluted 1/1,000 to furnish inocula for

TABLE 1

THE SURVIVAL OF TEST ORGANISMS IN STERILE SKIM MILK AFTER INCUBATION AT 20–25° C. FOR 6 DAYS AT DIFFERENT pH LEVELS

	(3) Developed by adding lactic acid			(2) L. acid.	(3) S. lactis	(2) Developed by adding NaOH		
Initial pH	4.15	4.82	5.15	3.87	5.00	7.55	8.56	8.98
A. *levendulae*	—	—	+	+	—	+	+	+
A. *griseus*	—	—	+	+	+	+	+	+
Organism #2	—	—	—	—	—	+	+	+
Controls at zero time incubation	+	+	+	+	+	+	+	+

L. acid. = *Lactobacillus acidophilus*
+ = growth on subculturing
— = no growth on subculturing
(2) = results of two determinations
(3) = results of three determinations

the TGE Agar pour plates. The plates were incubated 3 days at 20–25° before examination.

The pH's on the alkaline side of 7 were adjusted by using autoclaved 1/N NaOH. By adding this alkali to 10 ml. of sterile skim milk the volume necessary to give approximately the same pH in 500 ml. of sterile skim milk was calculated. These volumes were added to the flasks and the contents of the flasks were mixed thoroughly. The mixture was incubated in the same manner as the acid pH samples. Sterility was verified by microscopic examination. The milk was then put aseptically into sterile test tubes in 5 ml. amounts, average initial pH was determined and the tubes were inoculated as was done when the pH was on the acid side of 7. The procedure used for determining acid resistance was followed in determining the effect of alkaline reaction on the microorganisms. The results are given in Table 1.

No growth appeared on the surface of the milk tubes having a pH reaction below 7.55. *Streptococcus lactis* cultured milk was inhibitory to *Actinomyces levendulae* and Organism #2 but not to *Actinomyces griseus*. The pH developed by *Lactobacillus acidophilus* was not inhibitory to A. *griseum* or *A. levendulae* and the higher pH's, 4.15 and 4.82, adjusted by addition of lactic acid were detrimental to the spores of the three microorganisms. The spores of Organism #2 were destroyed by pH's of less than 5.15 regardless of how they were adjusted. When the milk reaction was adjusted to pH 7.55, 8.56, and 8.98 by means of NaOH, the three microorganisms were not destroyed.

THE SURVIVAL OF THE TEST ORGANISMS WHEN SUBJECTED TO THERMOPHILIC TEMPERATURES

Well sporulated agar slant cultures of the microorganisms were suspended in approximately 8 ml. of sterile skim milk. One ml. of each suspension was transferred aseptically to each of three sterile test tubes (20×150 mm.); one marked "10"; another, "20"; the third, "30"; and the fourth, "room temperature." Each set of a milk suspension of the organisms was placed in a water bath at 62±1° C. Similarly a second set of three tubes for each test organism was held at the 65±1° C. and each set held for 10, 20 and 30 minutes respectively. The controls consisted of a third set of suspensions and held at room temperature. At the end of 10 minutes the tubes marked "10" were removed from the baths, cooled to room temperature, and ½ ml. of suspensions were used to prepare TGE Agar pour plates. The same procedure was fol-

lowed at the end of 20 and of 30 minutes. In addition plates were poured at the end of 30 minutes from "room temperature" control tubes. All plates were incubated at 20–25° C. for 3 days. The results are recorded in Table 2.

TABLE 2

THE SURVIVAL OF TEST ORGANISMS WHEN INOCULATED INTO STERILE SKIM MILK AND INCUBATED AT 62±1° C. AND 65±1° C. FOR 10, 20 AND 30 MINUTE INTERVALS

	62±1° C.				65±1° C.			
	10	20	30	Room temp. control	10	20	30	Room temp. control
A. *griseus*	+ + + +	+	+	+ + + +	—	—	—	+ + + +
A. *levendulae*	+ + + +	+	+	+ + + +	—	—	—	+ + + +
Organism #1	—	—	—	+ + + +	—	—	—	+ + + +
Organism #2	+	—	—	+ + + +	—	—	—	+ + + +
Organism #3	—	—	—	+ + + +	—	—	—	+ + + +
Organism #4	—	—	—	+ + + +	—	—	—	+ + + +
Organism #5	+	—	—	+ + + +	—	—	—	+ + + +
Organism #6	—	—	—	+ + + +	—	—	—	+ + + +

—=no growth on plating
+ + + +=excellent growth
+=fair growth

Heating the milk suspension at 62±1° C. for 30 minutes will not completely destroy the microorganisms although fewer colonies developed after heating at 62±1° C. for 20 and 30 minutes than did after heating for 10 minutes at that temperature. None of the test organisms survived the incubation temperature of 65±1° C. after 10, 20, and 30 minute intervals.

The Isolation of Actinomycetes from Market Milk

Fellers (1922) stated that 2.5 percent of the microflora of the milk sources he had investigated consisted of *Actinomycetes*. The following procedure was followed to determine what percentage of the microflora was *Actinomycetes* in a local milk source. One ml. portions of 1/1,000 sterile water dilutions of milk samples obtained from a local dairy were plated daily and the plates incubated 3 days. The samples were plated in duplicate using TGE Agar and were incubated at 20–25° C. Table 3 shows the counts of ten different samples of normal market milk.

It will be recalled that *Actinomycetes* colonies were distinguishable on the room temperature controls after incubation 3 days at 20–25° on the TGE Agar plates of Table 2. It was concluded from the data in the above table that *Actinomycetes* resisting pasteurization temperatures make up less than 2.5 percent of the microflora of the local milk source and/or *Actinomycetes* resisting pasteurization temperature do not develop on TGE and Krainsky's culture media under the conditions of this study.

TABLE 3

QUANTITATIVE PLATE COUNT OF MARKET MILK ON TGE AND KRAINSKY AGAR MEDIA INCUBATED AT 20–25° C. FOR 3 DAYS

											Total
TGE agar	37	75	43	72	98	47	612	82	66	85	1217
Krainsky's medium	9	1	0	4	44	4	1	6	20	10	99

Note: After incubation for 7 more days at 20–25° not one *Actinomyces*-like colony was found on the 20 plates.

The Ability of Actinomycetes to Produce Phosphatase in Sterile Skim Milk

Sterile skim milk in about 15 ml. amounts was inoculated with the test organisms indicated in Table 4, were incubated at 20–25° C. 6 days, and then were examined to determine the ability of the microorganisms to produce phosphatase. Two determinations in duplicate were performed in this investigation. The standard procedure was followed as given in *Standard Methods for Examination of Dairy Products,* under Test A for phosphatase. The data are shown in Table 4.

TABLE 4

THE ABILITY OF ACTINOMYCETES TO PRODUCE PHOSPHATASE IN STERILE SKIM MILK

	pH Range	*Reaction*
A. *griseus*	6.5–6.6	—
A. *leveldulae*	6.5–6.6	—
Organism #1	6.3–6.4	—
Organism #2	6.4	—
Organism #3	6.4–6.5	—
Organism #4	6.3–6.5	—
Organism #5	6.5	—
Organism #6	6.3–6.4	—
Sterile control	6.3–6.4	—
Raw milk control	6.4–6.5	+

Actinomyces, griseus, Actinomyces levendulae, and the other *Actinomycetes* investigated do not produce phosphatase in sterile skim milk as revealed in the phosphatase test.

The Ability of Actinomycetes to Reduce Methylene Blue When Inoculated into Sterile Skim Milk and Incubated at ¼, ½, 1½, and 5 Hours

Ten ml. of sterile milk placed into sterile test tubes were inoculated with a loopful of suspension from one-week-old test cultures. The inoculated test tubes were incubated 2 days at 20–25° C. At the end of this time, one ml. of standard methylene blue thiocyanate solution (Standard Methods, 1941) was added to each culture previously warmed to 37° C. and each tube was stoppered with a sterile rubber stopper and shaken. After all the test tubes had been treated likewise, they were incubated in the 37° C. air incubator and methylene blue reduction observed after ¼, ½, 1½, and 8 hours. Two determinations were performed and each was done in duplicate. The results are shown in Table 5.

TABLE 5

THE ABILITY OF ACTINOMYCETES TO REDUCE METHYLENE BLUE WHEN INOCULATED INTO STERILE SKIM MILK AND INCUBATED AT 37° C. FOR ¼, ½, 1½ AND 8 HOURS

	Test I	*Test II*
A. *griseus*	+	+
A. *levendulae*	+	+
Organism #1	+	+
Organism #2	+	+
Organism #3	+	+
Organism #4	+	+
Organism #5	(2)	(1)
Organism #6	+	+
Sterile control	—	—

(1)=required ½ hour
(2)=required 1½ hours
+=methylene blue reduction within 15 minutes
—=methylene blue not reduced within 8 hours

All the microorganisms grown in sterile skim milk 2 days reduced methylene blue in all the samples within 1½ hours. Organism #5 was found to require up to 1½ hours to reduce methylene blue. At the end of 8 hours incubation methylene blue was not reduced in the uninoculated controls.

The Extent of the Destruction of Ascorbic Acid (USP) in Sterile Skim Milk Cultures of Certain Actinomycetes After Incubation at 37° C. for 1 to 5 Days

Since methylene blue was reduced by *Actinomycetes* milk cultures and reduced conditions in market milk favor the protection of its ascorbic acid content, it was decided to investigate whether or not *Actinomycetes* retarded the disappearance of the vitamin when it was added to sterilized skim milk. The procedure used and the results of the investigation follow.

Three hundred ml. of skim milk were sterilized by autoclaving it at 20 pounds pressure for 15 minutes. The milk was

cooled to room temperature. One ml. sterile distilled water suspension of sporulated agar slant growths of *Actinomyces griseus* and *Actinomyces levendulae* were added to two sterile brown bottles and 50 ml. of the cooled sterile milk were added to each. Also 50 ml. of the cooled sterile skim milk plus 1 ml. of sterile distilled water were added to a bottle that served as an uninoculated control. In 150 ml. of double distilled water 0.015 gram of ascorbic acid, USP, were dissolved, and the solution was sterilized by filtering it through a Berkefeld filter (W). Fifty ml. of the filtrate were transferred aseptically to the brown bottle containing 1 ml. sterile water suspension of the microorganisms. A third brown bottle containing 1 ml. of sterile water and 50 ml. of the above milk mixture served as the uninoculated control.

After inoculation of milk, all the cultures were incubated at 20–25° C. for 1 to 5 days inclusive, depending on what incubation interval was being investigated. During the incubation periods, the bottles were further protected from light by covers consisting of two layers of gray wrapping paper.

At the ends of the incubation periods, ascorbic acid activity remaining in the cultures was measured by titration with 2, 6 dichloro-phenolindophenol solution according to the instructions found in *Methods of Vitamin Assay* (Association of Vitamin Chemists, 1947). The only exception to the instructions necessary was in the extraction of ascorbic acid from the milk samples. Twenty-five ml. milk samples were diluted to 100 ml. in a volumetric flask with 3 percent HPO. The dilute acid both precipitated the casein and protected the ascorbic acid in the milk sample and filtrate from being oxidized by atmospheric oxygen. The curd was removed by filtration through a fluted filter paper (Watman's No. 1).

After discarding the first few ml. of filtrate coming through the funnel, 10 ml. of the subsequent filtrate were titrated with the dye. The number of ml. of dye necessary to titrate the ascorbic acid was multiplied by 40 to determine the number of ml. of dye necessary to titrate 100 ml. of sample. This value was then multiplied by milligram equivalents of ascorbic acid for each ml. of dye. The equivalent was established by titration of a standard ascorbic acid solution according to the instructions given in *Methods of Vitamin Assay* (Association of Vitamin Chemists, 1947).

Untreated milk samples served as blank corrections: i.e., volume of dye required to titrate the treated milk control minus that to titrate the untreated control was taken to be equal to the ascorbic acid activity remaining in the treated control; volume necessary to titrate extract from cultures of the microorganisms in the treated milk minus the volume necessary to titrate the cultures of the respective microorganisms in the untreated milk samples was taken to be equal to the ascorbic acid activity remaining in the treated milk cultures at the end of the incubation periods. Table 6 contains the results of these determinations.

TABLE 6

COMPARISON OF ASCORBIC ACID ACTIVITY REMAINING IN STERILE SKIM MILK CULTURES AT THE END OF 1, 2, 3, 4, AND 5 DAYS

Sample treatment	*1 Day*	*2 Days*	*3 Days*	*4 Days*	*5 Days*
Uninoculated skim milk plus ascorbic acid	8.80	10.75	2.70	4.84	0.836
A. *griseus* in skim milk plus ascorbic acid	7.60	11.76	....	5.17	5.55
A. *levendulae* in skim milk plus ascorbic acid	7.20	12.00	4.10	6.58	3.44

Note: Activity was measured in mgm. ascorbic acid/100 ml. milk.

The calculated ascorbic acid content per 100 ml. of milk was 14.3 mgm. in the uninoculated ascorbic acid fortified milk samples.

Ascorbic acid activity decreased with time in no regular fashion. Data in Table 6 indicate that *A. griseus* and *A. levendulae* have a sparing action on ascorbic acid. This action is apparent within 2 days but is undeniable at the end of 5 days.

The Utilization of Butter Fat by Selected Strains of Actinomycetes When Milk Is Standardized to 0.17 and 0.250 Percent Butter Fat

Skim milk was standardized by adding 370 ml. skim milk to 9 ml. homogenized 3.8 percent whole milk. After mixing carefully to avoid foaming, 17.6 ml. of this standardized sample were added to chemically clean Babcock skim-milk test bottles. The samples were sterilized at 125° C. for 15 minutes after the necks of the bottles were covered with 20 x 150 mm. test tubes. Sterile distilled water suspensions of sporulated agar slant cultures were made of the *Actinomyces griseus, Actinomyces levendulae,* and Organism #4. One-half ml. of the suspensions was used to inoculate the sterilized milk and each organism was used to inoculate 5 Babcock bottles. After mixing, the bottles were incubated at 20–25° C. for 6 days. The butter fat was determined according to the procedure in *Standard Methods for Examination of Dairy Products* (1941) and the average of 5 tests are tabulated below.

Rosse-Gottlieb ether extraction procedure was also used to determine butter fat utilization by *A. griseus, A. levendulae,* and Organism #4. Milk was standardized thus: 360 ml. skim milk testing 0.01–0.03 percent butter fat were added to 19 ml. of 3.8 percent butter fat, homogenized pasteurized milk. The mixture was poured to and from a bottle of identical size four times to effect thorough mixing. This standardized milk was sterilized by autoclaving at 125° C. for 15 minutes. After the milk had cooled, it was mixed and 35 ml. were transferred to 200 ml. sterilized prescription bottles. One ml. sterile water suspension of sporulated agar slant cultures of *A. griseus, A. levendulae,* and Organism #4 were put into the bottles and the latter labeled accordingly. One ml. of sterile water was put into the control milk sample. After mixing the contents, the bottles were laid on the flat side in the 20–25° C. incubator and incubated at that temperature 6 days. After thoroughly mixing the contents, the incubated samples were poured into weighing bottles and weighed. The 10 ml. samples were removed with a volumetric pipet; weight of each 10 ml. sample was determined by differences. The blank run on the reagents was found to yield 0.0001 gram of fat—a quantity within the range of error for the fourth place on the analytical balance. The results of the Rosse-Gottlieb fat determination (Standard Methods, 1941) are found in Table 7.

TABLE 7

BUTTER FAT REMAINING IN CULTURES OF SELECTED STRAINS OF *Actinomycetes* WHEN MILK IS STANDARDIZED TO 0.17 AND 0.250 PERCENT BUTTER FAT AFTER INCUBATION AT 20–25° C. FOR 6 DAYS

	Babcock [1]	*Rosse-Gottlieb I* [2]	*Rosse-Gottlieb II* [2]
Control	0.17%	0.250%	0.245%
A. *griseus*	0.05%	0.243%	0.232%
A. *levendulae*	0.11%	0.224%	0.215%
Organism #4	0.12%	0.230%	0.216%

(1)=average of 5 determinations for each microorganism
(2)=average of 2 determinations on same sample

Readings made with the Babcock skim milk bottle were accurate only to two places to the right of the decimal point and could be read with an accuracy of 0.005 plus or minus and the Rosse-Gottlieb method was accurate to three places to the right of the decimal point and the accuracy of agreement between duplicate samples was ±0.003. Both methods of butter fat determination indicated that *A. griseus, A. levendulae,* and Organism #4 utilize butter fat under the conditions of this investigation.

DISCUSSION

Fellers (1922) began his investigation of market milks when a supply consistently became bitter on standing. The strains of *Actinomyces* may have been thermoduric. The results of this investigation indicate that *A. griseus, A. levendulae,* and six other Actinomyces-like organisms isolated from the soil are destroyed within 10 minutes by 65±1° C. (Table 2). The long-time holding pasteurization process consists in heating milk to 62.5° C. and keeping it at that temperature 30 minutes. If the numbers of saprophytic *Actinomycetes* were great enough in the raw milk and the time and temperature of pasteurization were those given above, it is understandable how milk investigated by Fellers showed their presence.

Milk used in this study was processed at 151° F. (66.1° C.) for a minimum of 30 minutes by the local dairy. *Actinomycetes* absence from this market milk is understandable, assuming that these microorganisms were present in the raw product as received by the dairy. The pasteurization temperature used by that dairy can explain the negative results of Table 3.

Streptococcus lactis and *Lactobacillus bulgarius* produce 3 and 2 times, respectively, as much titrable acidity when grown in pure culture as when both are inoculated and incubated 3 days in the same flask (Weiser, 1948). On this basis both organisms have an inhibitory effect on each other within the time limit given above. It appears that the metabolic products elaborated by *S. lactis* are not inhibitory for *A. griseus* but are inhibitory for *A. levendulae.* The metabolic products of *L. acidophilus* are not inhibitory for *A. griseus* and *A. levendulae.* The data of Table 1 suggest that the developed anions are not inhibitory to *A. griseus* and *A. levendulae.* When the milk was adjusted to 4.82 by addition of lactic acid, both were inhibited, presumably by the lactate ion. On the other hand, the hydrogen ion activity appears to have an inhibitory affect on Organism #2, inasmuch as addition of the acid to the milk was inhibitory to it at pH 5.15–4.15 inclusive.

Milk samples whose reaction had been adjusted by addition of NaOH to pH 7.55, 8.56, and 8.98 were not inhibitory to *A. griseus, A. levendulae,* and Organism #2.

Actinomyces griseus and *Actinomyces levendulae* reduced methylene blue (Table 5) when they grew in sterile skim milk. It is known that reducing substances in milk, such as sulfhydrils, have an ascorbic acid-sparing action. Removal of atmospheric oxygen also has a sparing action on the ascorbic acid in milk. The sparing action of *A. griseus* and *A. levendulae* appears to result from the reducing metabolic products arising from growth in sterile skim milk or to removal of dissolved atmospheric oxygen by the microorganisms during metabolism.

A more definite statement than is given in the results following Table 7 regarding the utilization of butter fat cannot be made primarily on theoretical grounds. During 6 days growth, a large quantity of *Actinomycetes* protoplasm developed. Most of this growth was on the surface of the milk cultures. When each culture was mixed to suspend the microorganisms uniformly throughout the milk, a decrease in milk density resulted with an increase in volume. Assuming that no butter fat

had been utilized, the apparent butter fat had been utilized, the apparent butter fat percentage would be decreased. Theoretically the utilization of butter fat by *A. griseus, A. levendulae,* and Organism #4 can be questioned; therefore, butter fat utilization by these *Actinomycetes* should be investigated more completely.

SUMMARY

The addition of lactic acid to sterile skim milk was more toxic to *Actinomyces griseus* and *Actinomyces levendulae* than the biological acidity produced by *Lactobacillus acidophilus* grown in sterile skim milk. Several cultures of *Actinomycetes* studied tolerated a pH range up to 8.98. Moreover, *A. griseus, A. levendulae,* and six actinomyces-like organisms were able to reduce methylene blue; then growth in skim milk retarded the oxidation of ascorbic acid when added to milk. The test organisms appeared to utilize butter fat. A temperature of 62° C. for 30 minutes does not destroy all the spores of these organisms, when added to skim milk, while a temperature of 65° C. kills all the spores in 10 minutes. The growth of the test organisms in skim milk showed their inability to produce the enzyme phosphatase.

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IMPROVED DRINKING STRAW WRAPPERS * — ABSTRACT

DAVID LEVOWITZ, PH.D.

New Jersey Dairy Laboratories, New Brunswick, N. J.

1. While drinking straws, wrapped in "cigarette" paper, had been considered satisfactorily "protected" by many, recent criticism of the previous nature and of the chemical composition of the wrapper stock stimulated the drinking straw manufacturers to authorize the investigation of the microflora recoverable from both wrapped and unwrapped straws — freshly manufactured, warehoused, and sampled at point-of-use.

2. A technique for determining the microorganism levels of drinking straws was developed. After rinsing "standard samples" with sterile buffered distilled water, portions of the rinsings were plated to determine, per unit, total counts at 20° C. and 37° C., yeasts and molds, hemolytic streptococci, hemolytic and non-hemolytic staphylococci, and coliforms. The straws themselves were macerated with portions of the rinse waters, in control tests, and the filtrates similarly plated.

3. Straws, wrapped and unwrapped, sampled from freshly manufactured and from warehoused original cartons, were rinsed and pulped, and the rinsings and the pulp filtrates plated. In all instances, the straws demonstrated the practical absence of microflora.

4. Straws, wrapped and unwrapped, sampled from consumer-used dispensers at various types of outlets, were rinsed and plated. Unwrapped straws were consistently found to harbor substantial microorganism levels. Wrapped straws dispensed from opened original cartons exhibited appreciable concentrations which were generally lower than those of the unwrapped straws. Wrapped straws dispensed from open jars yielded a very much lower microorganism incidence.

5. The Drinking Straw Institute, Inc., is licensed to produce and distribute a germicidally impregnated wrapper stock which has been demonstrated to destroy within seconds, microorganisms brought into contact with it. The germicidal agent is non-toxic, in the concentration employed, and non-volatile; the original level will be recovered after extended warehousing at normal conditions.

6. The Institute will make its wrapper available to all drinking straw manufacturers, and will prevent its manufacture or use by unauthorized agencies. It will control the process and product fully, identify "improved" wrappers with a registered seal, and guarantee their composition.

7. Coliforms were not recovered from straws whose high levels of other flora attested to heavy contamination. This was found due to poor resistance of coliforms to desiccation; their death rate was more rapid from the hydrophobic surfaces of unwrapped straws than from the hydrophilic planes of wrapped tubes.

8. The rate of desiccation appears to be the factor influencing the levels of microorganisms recovered from wrapped and unwrapped straws, contaminated by consumer contact. Straws protected by the germicidally impregnated wrapper stock promise to remain perfectly sterile under even the most adverse conditions of consumer use.

* Presented at the Annual Meeting of the INTERNATIONAL ASSOCIATION OF DAIRY AND FOOD SANITARIANS, Philadelphia, Pa., October 23, 1948.

MILK and FOOD SANITATION

REPORT OF THE COMMITTEE ON APPLIED LABORATORY METHODS *

QUATERNARY compounds as sanitizing agents have been given increasing attention and use. For some purposes, and in many areas, the products have been accepted as sanitizing agents for food handling equipment; in other instances their usage has not been permitted pending the acquirement of additional knowledge on their germicidal and chemical properties.

Because of the potentially large number of radical combinations in the organic structure of the molecule, an extremely large number of different quaternary compounds is possible. The use effectiveness of the various compounds resides ultimately upon known tested bacteriorstatic properties under various conditions of temperature, reaction, concentration, contamination, stability time types of organisms and convenience of methods of measurement of their effectiveness, and use concentrations.

Of immediate importance to dairy and food sanitarians is the matter of relative germicidal or bacteriostatic properties and rapidity of measurement of concentrations of the different commercial quaternary compounds available. The measurement of concentrations of the quaternaries must become in finality, the tool sanitarians will use to maintain assurity of adequate germicidal treatment of facilities used in processing foods.

A number of chemical and bacteriological procedures have been developed, and are currently under study in many laboratories. The procedures on chemical tests, at least, have been published in periodicals not generally available to sanitarians. Some of the methods described are seemingly complex, in other instances seemingly simple.

The Committee on Applied Laboratory Methods has deemed it advisable to gather and present, in whole or in part, the more recently proposed procedures from the various publications, and to make them available for the help and understanding of sanitarians who will use them. The Committee in making available these references or procedures, does not imply their general recommendation. They are presented for their better understanding by sanitarians.

K. G. WECKEL, *Chairman*,
PAUL ELLIKER,
FRANKLIN BARBER,
C. K. JOHNS,
C. JENSEN.

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REPORT OF THE COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN *

THE annual reports of this committee from now on no doubt need to be broadened to include the general foods as well as milk and milk products, because of the constitutional change of the name of this organization to THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS.

As far as milk and milk products being a factor in the dissemination of communicable diseases to man, particularly when consumed raw, especial attention is called to the commendable action of the 1947 Michigan State Legislature in passing a law requiring compulsory pasteurization of milk and milk products, effective as of July 1st, 1948.

An interesting feature of this law is that any city, incorporated village or township, may have "raw milk and milk products" offered for sale within their corporate limits, by means of a popular vote at a general election, if and when ten per cent of the qualified and registered electors petition for such an election.

This appears to be a step in the right direction and your committee would urgently recommend that THE INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, entertain a resolution at this convention, commending other state legislative bodies to consider a similar law for the health and welfare of the American public.

Q FEVER STUDIES IN SOUTHERN CALIFORNIA (1)

"*Rickettsia burneti*, the causative agent of Q fever was recovered from the raw milk of four dairies in southern California. These recoveries were made in three laboratories: The Q Fever Laboratory, Los Angeles County, Calif.; The National Institutes of Health, Bethesda, Md.; and the Rocky Mountain Laboratory, Hamilton, Montana. Seven isolations were made from duplicate specimens studied in two of the three laboratories."

"While *R. burneti* was recovered from raw milk the available epidemiological evidence did not indicate that the drinking of milk was the cause of the majority of cases which have been studied thus far. However, that infected milk may serve as a source of infection to man by some mode as yet undetermined appeared to be a distinct possibility."

"Tests, as yet incomplete, indicate that the two methods of pasteurization in general use in two large commercial milk plants rendered the raw milk naturally infected with *R. burneti* apparently non-infectious for guinea pigs. Three tests using the vat method and four tests using the high-temperature short-time method of pasteurization have been completed. A fourth experiment with vat pasteurization was incomplete at the time of the preparation of this manuscript."

THE VIRUS DISEASES

The virus diseases were studied considerably this last year. This is vital because of their apparent increased incidence and from the angle of assurance that general foods and milk products even though properly pasteurized, are not vectors in the spread of virus pneumonia, poliomyelitis, influenza, the common colds, measles, mumps, etc.

As to influenza and measles, we do have certain prophylactic measures, which can be used in their prevention, but not so with the other virus diseases. Just what intermediary host, if any, is involved in the spread of these communicable diseases to man of course is not known, for which reason it is essential that research be continued in order definitely to rule out properly pasteurized milk, milk products, and general foods as sources of infection.

* Presented at the Thirty-fifth Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., Philadelphia, Pa., Oct. 21, 1948.

DEFICIENCY DISEASES

The paper by Krause (*2*) at the convention last year in Milwaukee on the nutritive aspects of milk products, brings to light the necessity of developing tests for evaluating the inherent nutritive factors of milk products and general foods now on the market. This is of especial value as concerns the deficiency diseases and lowered resistance to infection. It appears that more papers on the nutritive aspects of foods, especially from the angle of the essential amino acids, would be beneficial to the members. Likewise more work needs to be undertaken perhaps on the effect of bovine mastitis on the nutritive elements of dairy products. Easily applied tests for quickly determining the inherent nutritive content of foods from production through processing and storage before delivery to the final consumer would also help materially in curbing deficiency diseases that produce a lowered resistance to infection.

FROZEN FOODS

Just what role frozen foods play in the deficiency diseases or transmission of communicable diseases appears to be a matter for formal discussion before the Association. Food sanitarians of health departments, are confronted with the problems of proper (1) selection, (2) storage before processing, (3) processing, (4) freezing, and (5) distribution to the final consumer. The direct microscopic method of examining these foods is apparently opening a new field that will require the formulation of certain standards for the mutual guidance of the trade as well as control officials.

IN CONCLUSION

In conclusion reference is made to the July-August issue of the 1948 *Journal of Milk and Food Technology* for the latest U. S. Public Health Service compilation of diseases apparently involving milk and milk products as well as general foods.

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Q. Sharp, Cargille Scientific Company, 118 Liberty Street, New York City
Stone-Marshall, Chemiatric Corporation, Sparta, New Jersey
Amerse, Vestal Laboratories, St. Louis, Missouri
Klenzade Kit, Klenzade Products, Inc., Beloit, Wisconsin

REPORT OF THE COMMITTEE ON DAIRY FARM METHODS *

THE committee on Dairy Farm Methods is interested in doing what it can to promote uniformity of regulations for dairy farm procedures and uniformity of interpretation and enforcement of these regulations. It is interested also in efficiency of dairy farm methods. A great need exists for minimizing the amount of labor on dairy farms insofar as that is consistent with the production of milk of acceptable quality. Attention has been focused on this by the advanced average-age of dairy farmers that has been reported in some sections. The long hours of work required on dairy farms is undoubtedly a factor in young men choosing other vocations. There are other factors also such as rising costs of buildings and equipment. However, there is a need for shortening the work hours in the interest of greater efficiency and also in the interest of keeping desirable people satisfied with dairy-farm living.

Labor-saving methods are not necessarily methods that tend to ignore sanitation principles. On the contrary many of them encourage or favor greater sanitation in the production and handling of milk. Difficult, awkward jobs are most apt to be done poorly. The more a job can be streamlined or shortened the more apt it is to be done well.

Pen barns. Opinions of health departments vary in respect to pen barns. Some have hesitated to approve them because of the accumulation of manure in the loafing area while others have taken the attitude that they are satisfactory as long as the surface is covered with clean bedding. There is need for clarification of policy and interpretation of compliance concerning this.

A number of advantages have been claimed for pen barns. These include less labor required, fewer udder injuries (3), cleaner cows, more comfortable cows, greater flexibility in the use of the barn and greater utilization of roughages by the cows. The saving in labor is associated with less time for cleaning the barn. Fewer udder injuries may be related to a cow's freedom and the elimination of the edge of the gutter as a possible danger spot. Whether cows are cleaner depends on the bedding which is a limiting factor in the sanitation of pen barns. Plenty of bedding is a must. More comfort for the cows is claimed because of a softer, warmer bed. In comparison, stanchions often are not bedded completely and too often the bedding is pushed forward so that the hard floor is exposed. Greater flexibility in the use of the pen barn is claimed because the loafing area can be used for other purposes while a stanchion barn would not be so easily converted to other uses.

Disadvantages that have been reported for pen barns. They require more bedding, "boss" cows are troublesome, and odors and flies are hard to control. The extra-bedding requirement is important and in some sections where bedding straw is not grown in sufficient amounts or where the use of combines lessens its availability, it is a difficult problem and as mentioned above is a limiting factor in the use of this type barn. The disposition of cows with horns or "boss" cows depends on whether or not the herd is a show-herd. There is some difference of opinion as to the odors in pen barns. Some claim there are less odors in a pen barn properly kept than in a conventional barn not well ventilated. Ventilation is of great importance not only from the standpoint of odors but also because good ventilation helps to keep the manure pack dry.

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The question of spread of diseases among cows is of interest. Whether there is a tendency to greater spread of such conditions as brucellosis in pen barns is not known.

The milking rooms, or so-called milking parlors, used in connection with pen barns include both those where milking is done by hand and those where machines are used.

Pen barns are being used more now than formerly but they are not accepted as better than the conventional barns by all producers or sanitarians. They are to be accepted in the forth-coming edition of the U. S. Public Health Service Ordinance and Code (2), and this committee recommends that pen barns when properly managed as to sanitation be approved by the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS.

Milk houses. In the New York-New Jersey-Connecticut area considerable progress has been made in standardizing recommendations for milk-house construction and location. In many areas, however, recommendations being made for milk houses are quite variable. It is recognized that factors such as climate, average size of herd, etc., dictate certain details concerning construction and design of milk houses, nevertheless it is discouraging when experts disagree as to size, construction, or other important features. The plans * that have been approved by several of the eastern state and city health departments, by the U. S. Public Health Service, as well as by Cornell University, Rutgers University, and Pennsylvania State College have been studied perhaps by more interested people than any other and the committee recommends that in the interest of uniformity these plans have the endorsement of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS.

Physical examination of the udder. Mastitis in degrees ranging from mild to severe is common in dairy herds throughout the country. This is of importance from the standpoint of quality of milk and also from the standpoint of herd management or efficiency of milk production. Our ideas concerning quality do not approve of milk from mastitis cows being accepted for human consumption. Yet much such milk commonly is received and used for bottling or manufacturing purposes. It is true that there is no serious health problem involved in properly pasteurized supplies but from the aesthetic angle it is undesirable. Cows with mastitis also are not as good producers as if they were healthy. Such cows cost producers a lot of money especially at present prices of milk. With healthy cows either the same amount of milk could be produced with fewer cows or with the same number of cows a greater production would be obtained.

Regulations commonly state that milk from mastitis cows should be rejected, yet so much milk that can be so classified is being received that it poses a big problem, the practical solution of which is not clear. The logical place to begin would be the source, or in other words, the udders of the cows. Regular annual or semi-annual physical examination of udders by competent veterinarians seems to be a good investment. This should be supplemented by closer observation of udder conditions and regular use of the strip-cup by the milker. Locating cows with some abnormal condition is the first step in any program of mastitis control. Furthermore strip-cup examination gives the best opportunity to hold out abnormal milk before it has been mixed with other milk with the resulting lowering of its quality also. Sanitarians should teach the importance of locating cows with mastitis from the standpoint of sanitation and from the standpoint of better herd management and efficiency of milk production. The treatment of mastitis, of course, is a job for a veterinarian but milk sanitarians can be of great service by encouraging practices that tend to minimize the incidence or spread of mastitis

* Copies are available from Portland Cement Association.

within herds, or in other words, teaching "herd hygiene."

The situation focuses attention on a need for the development of rapid receiving-room tests for the detection of mastitis milk. Sanitarians can help here by urging and supporting such research programs at state experiment stations or elsewhere.

Rapid milking procedures. Since following rapid milking procedures has done much to reduce production costs as well as being a help in improving milk quality, the committee wishes to reemphasize them and urge sanitarians to teach them whenever practicable.

Use of DDT for fly control. Observation generally indicates the proper use of DDT has been a very great help in the control of flies. Emphasis should be placed on the "proper use," however. In general the directions given by reputable manufacturers have proven satisfactory. The use of DDT is not a substitute for other fly control measures such as the elimination of flybreeding places. The control of flies to the extent that the population on dairy farms is reduced to a minimum is important from the standpoint of milk quality and also from the standpoint of greater efficiency in milk production. It is important also in herd hygiene because flies are a factor in the spread of diseases among livestock.

Straining in the barn. The disadvantages of straining milk in the barn are familiar to all. There are practical difficulties, however, in getting compliance with the regulation requiring that all milk be strained in the milk house. More trips to the milk house are required. This leads to the temptation to leave milk sitting in uncovered pails in the barn until enough is accumulated to make up a load. This subjects the milk to the very type of contamination that prompt removal for straining is supposed to prevent. In view of this the U. S. Public Health Service has recommended that straining in the barn be approved, provided the cans are kept off the barn floor and the strainers are kept covered (2). A milk can standing on a dolly a few inches above the floor and topped with a pedal-operated covered strainer should be an improvement over an open pail sitting on the floor. It is important to keep cans off the floor in the interest of their cleanliness and the cleanliness of the cooling water. A pedal-operated strainer cover would eliminate the danger of laying the cover down where it might become contaminated or forgotten. It would also lessen hand contact with the cover. The design and construction of such covers should be given careful attention. At present such covers are not available to the knowledge of the Committee.

This committee supports the position taken by the U. S. Public Health Service and recommends this association approve straining in the barn under the conditions outlined. If suitable covers for strainers are not available, however, the committee suggests the approval of pouring into milk cans in the barn provided the cans are kept covered, except during pouring, and are kept off the floor.

Straining in the barn calls for special care in the control of flies and it is entirely reasonable to refuse approval of such a practise unless flies are under control.

Germicidal detergents. During recent years much attention has been given to studies of cleaning compounds in efforts to find improved cleaners. An interesting development along this line is the introduction of germicidal detergents. These have not been used long enough or under enough conditions to predict how successful they will be eventually but the evidence to date is promising.

At present, opinions vary as to whether germicidal-detergents should be recommended to dairy farmers generally. Some feel that the producers should be properly instructed first in order that they do not assume that such compounds are "cure-alls" and fail to give attention to other necessary details. Probably if these compounds are used wisely they will give satis-

factory results just as other methods are satisfactory when used correctly. No method is automatic. Further trials with these compounds are needed in which their action in different types of waters are determined.

Simplification of dairy farm work. It is desirable wherever possible to simplify the work on dairy farms when this can be done without detriment to the quality of milk produced. Many suggestions have been made, from time to time, for saving labor here as elsewhere. Some are practical and some are not. Obviously if producers invested in every new gadget that is suggested they would soon have their farms cluttered with equipment that did not prove to be of practical use. There is no dodging the idea though, that dairy farm work can be simplified and, if as milk sanitarians our best efforts are put forth, many helpful suggestions can be made to those in position to use them.

One of the unpleasant and time-consuming jobs on dairy farms is barn cleaning. So-called gutter cleaners are being used in a few barns (5) and are worthy of our attention. If they do a good job of cleaning and are not too expensive to install or use they may be great labor-savers and at the same time keep more barns clean. It is too early to predict how successful they will be but thought could well be given to policies concerning their design, construction and care.

Heating of the milk-house is another problem that needs improvement. A warm milk-house is a necessity if we expect producers to do a thorough job of caring for utensils there. Washing utensils in a cold milk-house is very difficult and unpleasant. Some more or less automatic source of heat is desirable. Stoves which burn coal or other fuel often fill the room with unpleasant fumes and odors and are messy and require considerable care. Besides they are fire hazards. The Rochester Dairy Company of Rochester, Minnesota, has described heaters consisting of blower type electric units installed on wall brackets and thermostatically controlled. When these are set to cut off at 45° F. they prevent formation of ice on the floor, freezing of solutions used in milking machine inflations, and make work in the milk-house more pleasant. An infra-red heater was described recently also (4). It consists of a rack with several infra-red lamps mounted to direct the rays to the object being heated. It is claimed that it is inexpensive to make and inexpensive to operate.

Many milk-houses are not equipped with water heaters. A convenient supply of hot water is such a help in the proper care of dairy utensils its value should be emphasized by sanitarians.

Other labor saving devices that are of interest include a hoist for lifting cans out of cooling tanks. Full cans of milk are heavy and the position in which a man stands when lifting them from the tank is not best for lifting. Often milk is spilled into the water and this becomes a sanitation problem. The temptation is to neglect draining the tank, cleaning it, and putting in fresh water. That takes considerable time and work and is expensive especially in electric cooling tanks. Another labor saver is a track such as a regular barn-door-roller track extending from a position above the tank to the outer edge of the loading platform. With this and a hoist, cans of milk can be taken from the cooling tank and delivered to the shipping platform at truck level without lifting manually and without danger of spillage.

Other aids include complete sets of correct types of brushes for cleaning utensils and the use of correct type of utensils. Sanitarians could take advantage of the help given by the 3-A specifications for milk pails, strainers, and milking machines. The Committee on Sanitary Procedure has these under advisement. The need for sanitary standards for milk pails is shown by figures recently released by the Dairyware Manufacturers Committee on

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REPORT OF THE COMMITTEE ON FOOD-HANDLING EQUIPMENT *

OUR President, who was one of the instigators of the Committee on Sanitary Procedure, and who has seen the improvements made in the sanitary design of dairy equipment as a result of the diligent work of that Committee, recognized the need for similar activity in the food equipment field. Early this year, the Committee on Food-Handling Equipment was established.

On June 20, at the University of Michigan, the Committee held its first and only meeting of the year. Four of the seven members were present. Our first consideration was an attempt to analyze the problem assigned. Several members had, for a number of years, been members of the Committee on Sanitary Procedures and it was natural to draw on the experience gained in formulating sanitary standards for dairy equipment.

It was immediately recognized that the food field is very much more diversified than the milk field. The food field comprises many industries including retail food, bakery, cannery, packing, frozen food, candy, soft drinks, and several more. Each industry has its own organization and sometimes there are several organizations within an industry. Then, there are the manufacturers and distributors of equipment allied with each of these industries. Furthermore, there is not a single national organization that represents all sanitarians working with the various food industries. The National Association of Sanitarians and the Association of Food and Drug officials as well as this Association represent groups of food sanitarians. The National Sanitation Foundation has taken an active role in the improvement of the sanitary design, construction, and operation of equipment used in the food field.

It is our understanding that the purpose of the Committee is to attain the best sanitary design and construction of food handling equipment possible within the realm of practicability, to attain mutual agreement on sanitary standards, and to attain universal acceptance of such sanitary standards.

The attainment of this goal is a large and difficult but worthwhile undertaking which will require years to accomplish. It can be reached through the collaboration of allied groups and the cooperation of the regulatory officials. If sanitary standards are to be universally accepted, they must have the approval of all groups in the field. One way that this may be accomplished would be for the President of this Association to invite the National Association of Sanitarians and the Association of Food and Drug officials to nominate one or more of their representatives for appointment to this Committee. Another possibility is to encourage the formation of a parallel Committee of each of these Associations with the Chairmen of the Committees representing the three Associations and functioning as a board of review. The key to the problem of gaining acceptance of standards which will eventually be evolved, is to give each Association a responsibility of participation, and a pride of authorship. For these reasons we favor the plan of similar Committees in parallel organizations.

A similar unity of expression is needed for the many commercial groups that manufacture and use the equipment. We are fortunate that such an organization has recently come into existence and has already made great strides toward the goal of sanitary design of food-handling equipment. With the approval of the officers of this Association, we would like to extend to the National Sanitation Foundation an

* Presented at the Thirty-fifth Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., Philadelphia, Pa., Oct. 21, 1948.

invitation to collaborate in this work and to offer our full cooperation. The Foundation appears to be the logical organization to function as a central clearing house and representative for all commercial groups. It is already functioning in this capacity and, through its clinic activities, has recommended design and construction specifications of equipment used in the retail food and drink serving industry.

Approval of these recommended sanitary specifications for food equipment by a Committee representing all food sanitarians would aid materially in attaining universal acceptances of the standards. The Committee of Sanitarians could and should offer constructive criticism in developing such sanitary standards.

The 3-A symbol for accepted sanitary standards of dairy equipment has become recognized and universally accepted by that industry. A parallel means of identifying sanitary standards of food equipment would seem to be desirable. It has been suggested that the symbol "N.S.S.", an abbreviation for "National Sanitary Standard", be considered. This symbol would be appropriate for all national organizations of food officials and all national organizations or groups of the various branches of the industry. The copyright may be obtained and retained by an organization representing either industry or sanitarians but the granting thereof should specify that its use is restricted to specifications accepted by both branches of the industry.

A "3-I" symbol representing the three basic interests involved, namely:

The public, through official agencies,
The manufacturers of equipment,
The users of equipment

would be truly symbolic of the interests involved. It would be in keeping with the "3-A" symbol and would lend itself to artistic embellishment.

Our Committee recommends that a generally acceptable plan of operation be worked out as a first step before the committee attempts to deal with specific items of equipment.

C. W. WEBER, *Co-Chairman*
C. A. ABELE, *Co-Chairman*
J. ANDREWS L. DODSON
P. DE KONING J. TRICHTER
B. WALKER

Dairy Farm Methods

(Continued from page 286)

Sanitary Standards (1). In 1940 17.3 percent of the pails were of sanitary construction while in 1946 11.6 percent of the pails manufactured were of sanitary construction. This points to a need for instruction of regulatory groups and producers in regard to what constitutes a sanitary pail. Producers should be encouraged or required to replace old utensils with new ones of approved specifications as soon as such utensils become available. Obviously utensils built for ease of cleaning together with proper brushes will make cleaning easier.

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Committee:

M. P. BAKER, *Chairman*
J. F. BLACKLOCK R. L. GRIFFITH
C. F. BLETCH R. M. C. HARRIS
L. W. BROWN G. H. HOPSON
L. E. BOBER M. M. MILIER
E. H. PARFITT

REPORT OF THE COMMITTEE ON FROZEN DESSERTS

As one reads the reports of the members of this Committee one fact stands out very clearly, namely, that there has been a large increase in the number of manufacturing units for frozen desserts in both the United States and Canada. This has been a natural development due to the increase in population, the spreading of the people into suburban areas, the increased purchasing power, and finally a realization of the high nutritive value of ice cream and ice milk.

The increase in the number of small manufacturing units has created a corresponding inspection problem to the boards responsible for the sanitation of the manufactured products. The small place is frequently run by a person who has had no previous experience with dairy products. They have many other duties, in addition to making frozen desserts, to attend to since they are generally run in conjunction with a drug store, grocery, restaurant, dairy bar, etc. Accordingly, the manufacture of frozen desserts is only a small part of the whole business. This necessitates hiring untrained help to make the product. From an regulation standpoint it is much easier to control a few large manufacturing units with trained personnel than many small units with either trained or untrained personnel. Inadequate facilities to handle the mix and to store the finished products properly further complicate the problem.

Another reason for the increased growth of the small manufacturing units has been the production and wide use of prepared mixes. These mixes may be purchased as fluid, concentrated, or dry mixes. The purchase of such mixes greatly simplifies the making of ice cream or ice milk since they may be purchased in sealed containers in quantities suitable for any size batch. World War II gave impetus and demonstrated the practicability of preparing mixes in this manner. During the last year of World War II approximately 100,000,000 pounds of dry and concentrated mixes were shipped to the Armed Forces. Most producers of dry mixes now sell the basic mix which contains all the milk solids and only about 5 percent of the total sugar which requires the manufacturer to add the balance of the sugar when the mix is made into ice cream.

The future use of prepared mixes is largely dependent upon uniform, practical, sanitary regulations governing all mixes whether fluid, dry, or concentrated. The enactment of such regulations to replace the antiquated laws now in force in many places which require the ice cream maker to pasteurize the reconstituted dry milk before freezing will do much to protect public health and promote the use of such prepared mixes.

Adulteration of Ice Cream Mixes

The shortage of milk fat and the great demand for ice cream during World War II prompted many manufacturers to resort to the use of vegetable oils to replace milk fat for making ice cream. Texas for instance passed regulations which permitted the use of vegetable oils to replace milk fat. These regulations have since been revoked but there is still pressure from some quarters to legalize the use of vegetable oils in dairy products. It is also known that vegetable oils are still being used to some extent to replace milk fat in certain parts of the United States in complete disregard of the law.

The vegetable oils most commonly used are cotton seed, corn, peanut, and soy bean. These are the same oils used for making margarine, the substitute for butter, and in salad dressing

and mayonnaise. Therefore there is a precedent for their use in foods and in a dairy product. In regions where milk fat is scarce and expensive, it is understandable why certain elements in the ice cream industry would gladly substitute vegetable oils for milk fat.

This of course is a short-sighted policy since it lowers the quality of ice cream on which the future of the industry largely depends. This is reminiscent of the early days of the industry when certain ice cream manufacturers added starch as a filler which was a detriment to the quality of the product. It is, therefore, necessary for public health officials to be cognizant of such practices on the part of unscrupulous manufacturers and to protect the public and the industry itself against such adulteration.

It is now possible to obtain milk fat in several different forms. Where the supply is close to the manufacture, 40 percent cream is usually used. However, where the distance between the supply and user is great, it has been necessary to concentrate the milk fat to save space and shipping charges which at present are high. Sweet cream butter pasteurized at 170° F. for 30 minutes and containing a minimum of 80 percent fat and scoring 92–93 if held at 0° F. is an excellent source of milk fat for ice cream. Plastic cream containing 80 percent milk fat is being used in greater amounts each year. It should be pasteurized at 170° F. for 30 minutes and held at 0° F. until used, the same as butter. There is a difference between the fat globule membrane of milk and cream and that of plastic cream. The fat globule membrane which consists largely of lecithin is thinner on plastic cream than on milk or cream, and ruptures upon cooling or freezing of plastic cream and oils off more readily during the pasteurization of the mix.

Sweet butter does not contain as much lecithin as plastic cream because the lecithin is released to a greater extent into the buttermilk during churning. Since sweet butter contains less lecithin than plastic cream, it keeps better because the lecithin in the membrane oxidizes more readily than the fat inside the membrane. However, the keeping quality of plastic cream is satisfactory if made from high quality milk or cream and processed properly. Some health officials improperly classify plastic cream as butter. There is a difference between them as shown by electrical conductivity tests.

The keeping quality of frozen cream, sweet butter, and plastic cream depend on producing them from high grade milk, processing, pasteurizing, and storing them properly. If this is done, they will keep as long as nine months without noticeable loss in quality. Thus, it is possible to keep them from the peak production of one season to the next thereby lowering the cost of the milk fat in ice cream.

The report of other members of the Committee follow. They present their views and the latest developments in their respective states.

A REPORT ON SOME PHASES OF THE ICE CREAM INDUSTRY IN CANADA, 1948

W. C. CAMERON

Chief, Grading & Inspection Services, Dairy Products Division, Department of Agriculture, Ottawa, Canada

As reports for this Committee are usually prepared in September of each year, it is not possible to give any definite statistics regarding production of ice cream for any particular year. However, it is felt that reference should be made in this report to the very large increase in production which occurred in Canada during 1947. According to figures released by the Dominion Bu-

reau of Statistics, production of ice cream for that year was 48.8 percent greater than during 1946, the actual increase being 7.68 million gallons of ice cream. This increase in production has also been carried over into the present year, for production of ice cream during the first nine months of 1948 has been reported as being 9.8 percent higher than during the corresponding period of 1947.

It is also of interest to note that there has been a corresponding increase in the number of operators. For instance, the number of firms or persons who do not manufacture their own mix (commonly known as "counter-freezer operators"), was 23.9 percent higher in 1948 than in 1947, and the number of firms making mix either for their own use or for resale to others was 13.3 percent greater in 1948 than during the previous year. The greatest increase in the number of counter-freezer operators occurred in the Province of British Columbia, adjacent to the Pacific Coast, the increase being 49.3 percent.

It is felt that the relatively large increase in consumer demand for ice cream is due mainly to three factors: first, prices asked for ice cream in all forms have not advanced as rapidly as those for other foods; secondly, the ability of the consumer to secure all the ice cream he requires at all times, and thirdly, the ever increasing realization of consumers that ice cream is a highly nutritious food for both children and adults. Insofar as prices are concerned, it would appear that the average overall increase has not been greater than 15 percent. Cones can still be purchased for a nickel, and although chocolate-coated pies, stick novelties, etc., cost two or three cents more, a generous amount of ice cream can still be purchased for seven or eight cents. Ingredients required for the basic mix have been in generous supply, except in the case of gelatin, although acceptable substitutes have always been available. It is true that the costs of ingredients used have materially increased, particularly milk fat and serum solids, but no doubt the pronounced increase in volume of products made has enabled manufacturers to hold their prices relatively close to the ceiling levels which were in force during the war years.

There has been one change in the standards of composition required by legislation for ice cream manufactured and sold across Canada, namely, the deletion of a minimum weight of five pounds per gallon which was enacted as a means of controlling overrun. It is generally felt that by requiring a minimum weight of food solids per gallon, including a minimum proportion by weight of milk fat, overrun can be satisfactorily controlled, and provision made for varying the type of ice cream in accordance with consumer preference. Present standards of composition are as follows:

1. Not more than 10.5 percent or less than 9.5 percent by weight of milk fat.
2. Not less than 34 percent by weight of food solids.
3. Not less than 1.7 pounds of food solids per gallon of which amount not less than 0.47 pound shall be milk fat.
4. Not more than ½ of 1 per centum by weight of stabilizer.
5. No fat other than milk fat shall be used.

During the present year, it has been evident that ice cream pre-packaged by the manufacturer is becoming more popular with consumers. Supplies of packages available to the trade were better, resulting in a wider variety of packaged goods being used, including bricks, chocolate-coated bars, stick novelties, redi-rolls, "tak-home and walk-away" sundaes, cups with capacities of one-quarter pint and less. There is no doubt that a very large proportion of the consuming public want ice cream that has a good body, smooth texture, and packaged in a sanitary package. The majority of manufacturers will undoubtedly admit that packaged ice cream, hardened as quickly as possible and kept at a constant low temperature,

is better for both the retailer and consumer and is far more sanitary.

Many will agree that bulk ice cream is not completely processed until it is dipped and hence the body and texture vary considerably. For instance, although the ice cream may be drawn from the freezer at 110 percent overrun, it may be depressed to 80–85 percent when dipped. On the other hand, pre-packaged ice cream may be drawn at 100 percent overrun and sold without variation. Hence, it is quite understandable that many dealers are more satisfied with a constant known percentage of profit than with one that varies from day to day, and for this reason, prefer pre-packaged ice cream.

Fom a sanitary viewpoint, a great deal can be said in favor of packaged goods. It is regretted that methods of dipping bulk ice cream are still far from sanitary, particularly the care of scoops, etc., as it is still a common sight to see such scoops in bowls of cold water, such water having every appearance of not being changed very frequently. On the other hand, hardening cabinets in retail stores are often neglected by both manufacturers and retailers. Many of these cabinets are very unclean due to the lack of defrosting and cleaning, and the smell emanating from cabinets that have been used to store meat and fish at times is very undesirable. It would appear that far more education must be carried on respecting the methods of defrosting and cleanliness, particularly by the manufacturers, who, in many cases, are the owners of the hardening cabinets. It may be of interest to record that the management of one of the largest ice cream manufacturers in Western Canada became very alarmed at the number of complaints received from private citizens respecting unsanitary methods practised by many retail dealers in the handling and dispensing of their ice cream. This firm was so concerned that they have set up within their plant a replica of what a retail outlet should have to dispense ice cream in a sanitary and efficient way. Regular classes are held for thei retailers with demonstrations of correc sanitary methods. Moving picture film on this subject have also been shown These classes have been so successfu and become so popular that the man agement of two of the largest depart mental stores in the same city are hav ing all employees working at their sod fountains, attend these classes at regu lar intervals. This is just an illustra tion of what can be accomplished whe members of the industry realize tha sanitary methods of handling and dis pensing ice cream are of primary importance to the consumer.

In Canada, enforcement of legisla tion dealing with sanitary control i the manufacture and sale of food prod ucts is the responsibility of the Federal, Provincial, and Municipal Department of Health, and there is evidence that these officials are becoming more conscious of their responsibilities. For instance, on the West Coast, as previously mentioned there has been a very decided increase in the number of counter-freezer operators, including those selling "soft" ice cream from the freezer. Sanitary conditions at many of these outlets have been far from satisfactory, and steps have been taken by the Provincial officials not only to enforce more rigidly but enlarge existing legislation for greater protection to the consuming public.

In conclusion, may we say that the ice cream industry in Canada, when freed from wartime controls concerning production, has been able to meet the expected increased consumer demand for their products. Equipment has been replaced and modernized, methods of distribution greatly improved, yet there is still much to be done regarding improvement in sanitation, particularly at retail levels. There is no doubt that the real future of the industry still lies in a quality product, properly packaged for home consumption and handled under proper sanitary conditions by all concerned before reaching the consumer.

THE ICE CREAM SITUATION IN FLORIDA

J. M. SCOTT
Chief Dairy Supervisor, Department of Agriculture, Gainesville, Florida

Ice cream work in Florida during the past year has been similar to former years with one or two exceptions. For one thing, more people are going into the ice cream business. The chief increase has been in the greater number of retail ice cream manufacturers.

Some one may say this has nothing to do with inspection work. Well, it has a lot to do with it, because very few of these people know anything about the business. Some high pressure salesman comes along and makes the prospective ice cream maker think everything is "peaches and cream"; all the operator has to do is pour the mix into the machine and dish out the ice cream.

Some of the manufacturers of ice cream equipment seem to be having trouble in getting their equipment finished in the proper manner. It has been necessary to condemn a number of machines because of rough interior finish which makes the equipment hard to clean and keep clean. Then some are trying to use various types of plastic to replace stainless steel. This does not always work satisfactorily.

A short time ago we found one operator trying to substitute vegetable and animal fat in his ice cream mix in place of milk fat. He knows better now.

The ice cream manufacturers on the whole are making a much better quality ice cream than was possible during the war.

THE FROZEN DESSERT FIELD IN CALIFORNIA

O. A. GHIGGOILE
Bureau of Dairy Service, Department of Agriculture

Attractive "drive-in" installations seem to be the trend of the year. In contrast to the conventional small "counter-freezer" factories in the past, many of which were in small rooms barely large enough for one person to get around, and producing a product (ice milk) with a milk fat content of 4 percent and an overrun between 75–125 percent, we now have attractive, well kept "drive-in" factories located in an area of two parking lots along the highways or near busy intersections.

These new factories with modern type freezers produce a product (ice milk) with a milk fat content of 6 percent and an overrun between 30–40 percent. The rooms, as a rule, are 10 feet by 20 feet with walls of plate glass on three sides almost to the floor, well lighted and ventilated. The product is dispensed directly from the freezer to the customer through an opening not to exceed 180 square inches. The opening is properly screened when not in use. The volume of business enjoyed by this type of factory would indicate that (1) the customer is attracted by the cleanliness and neatness of the visual operation; (2) the convenience and ease of access to the product; (3) the public is becoming more interested in a heavier product with less fat than a high fat product; and (4) the preference for a soft product.

The installation of these small factories is primarly responsible for the increased number of factories manufacturing frozen desserts. In 1940, 1,005 factories reported the manufacture of frozen desserts in California. In 1945, the number dropped to 591, and at the present (August 26, 1948) 1,058 licenses have been issued in 1948 for the manufacture of frozen desserts, with several applications still on hand awaiting approval.

Although the number of manufac-

turers is increasing, the amount of products manufactured is decreasing. Therefore, it is obvious that there is an increase in number of manufacturers competing for less volume. It appears to be a case of survival of the fittest which, I believe, means that the ones producing a uniform high quality product will be the ones to survive. Higher frozen dessert prices will definitely meet with consumers' resistance, so the alternate is to produce a high quality product with a lower milk fat content.

Another definite trend in the manufacture of ice cream is toward the use of emulsifiers. These products first made their appearance on the market about ten years ago but did not become popular until about two years ago. There are three groups of emulsifiers: (1) A mixture of monoglycerides and diglycerides; (2) esters of fatty acids and sorbitol or sorbitan; (3) esters of fatty acids and polyoxyalkyline derivatives of sorbitan. These emulsifiers are usually sold under trade names and, as a rule, are in combination with a conventional stabilizer such as gelatin, vegetable gum, or alginate. They have the property to effectively combine the milk fat with the water in mixes into an emulsion. These products are added to the mix before pasteurization and are supposed to improve the texture of ice cream and to control shrinkage. There is some evidence to show that the texture of ice cream is improved but the effect on shrinkage has yet to receive definite confirmation. From present observation, the use of emulsifiers in ice milk is not recommended since little or no improvement has been noted in the texture.

Until a year ago, there was some question as to the legality of using emulsifiers in frozen desserts as the regulation made no mention of emulsifiers. However, on October 1, 1947, a regulation became effective to provide that "stabilizers" as provided in the law are construed to be stabilizers and emulsifiers which help to maintain a desirable body or texture in frozen desserts by functioning in one or all of the following ways:

"(a) by combining with a portion of the water normally present in the frozen product to form a jell structure in said product;

"(b) by assisting in the maintenance of a stable fat emulsion in the frozen product."

When emulsifiers are used in frozen desserts, they are considered on the same basis as stabilizers so that the amount used does not exceed 0.6 of one percent.

Generally speaking, better grades of flavoring extracts are now being used. This trend is most noticeable in the case of vanilla ice cream as manufacturers desire to comply with the State Food and Drug standard for vanilla rather than label their products "artificially flavored." The status of vanilla extract used in ice cream has not been clear; therefore, it has been somewhat cleared through a regulation promulgated and adopted by the California Department of Public Health as follows: "Vanilla extract for ice cream manufacturing purposes only shall be the hydro-alcoholic extraction of 13.5 ounces of vanilla beans to each gallon, to which is added 1⅛ ounce of methyl vanillin, having a Wichman lead number of not less than 0.60." This standard is promulgated pending Federal standards and for intra-state use only by the ice cream manufacturing industry.

A close supervision is being exercised over the labeling and composition of frozen desserts to prevent deception and fraud. During 1947, a total of 4,840 investigations were made on advertising and labeling of frozen desserts; 7,372 samples of frozen desserts and mixes were analyzed in our laboratory upon which 14,593 chemical or bacteriological determinations were made of which 2,019 determniations were at variance with established standards. This does not mean that 2,019 samples were below standard, because there can be as high as 5 deter-

minations made on one sample all of which may show deficiencies.

The California law requires frozen desserts, when sold by the manufacturer or retailer, to contain not more than 75,000 bacteria per gram. The milk fat standard for ice cream is a minimum of 10 percent for plain ice cream and a minimum of 8 percent for fruit and nut ice cream. The amount of stabilizer must not exceed six-tenths of 1 per cent and ice cream must contain not less than 1.6 pounds total food solids per gallon and ice milk not less than 1.3 pounds of total food solids per gallon.

There were 4,306 lots of products examined for quality resulting in the condemnation of 49 lots as being unfit. To determine the food solids in ice cream, it is necessary to weigh the product. A total of 5,816 units of ice cream and ice milk were weighed for food solids determinations.

What promises to be an outstanding development as far as California is concerned is now being experimented upon by one of our larger manufacturers. It is proposed that the milk products be pasteurized, concentrated, and homogenized at a country plant close to the production of the milk and then transported to the city plant where it will be standardized to the desired consistency. Significant savings will be made in the pasteurization and cooling of the product and in homogenization of the milk products only, as sugar being in solution and the stabilizer being in colloidal suspension homogenization of these products is not necessary.

A law which became effective last fall requires certain rooms to be provided in milk products plants to carry on properly the required operations. Separate rooms must be provided for receiving, processing, washing and sterilization, bacteriological and chemical analyses, boiler and machinery, storage of supplies, toilets, lavoratories, and lockers. However, in the case of small ice cream factories and other small operations, all these rooms are not needed because of the nature of the business. Therefore, to eliminate waste space and excess building cost, a regulation was promulgated to the effect that the term "separate rooms" as used in the law shall be construed to mean that separate rooms are required for conducting any of the operations listed therein and does not necessarily mean that all rooms must be included if the nature of the business does not warrant them.

Perhaps the one thing which will bring about a better constructed plant is that portion of the law which also became effective last fall and requires that new milk products plants shall not be constructed nor extensive repairs made to existing buildings without first submitting to the Director of Agriculture plans or blue prints showing in detail the nature of the construction or alterations and receiving his approval in writing.

Although this phase of our control program occupies a considerable portion of our time, it is, nevertheless, a sound program and will pay great dividends and has brought forth remarkable results. We know beforehand what the building will be and are certain of the fact it will pass inspection and be eligible to receive a license. Too often in the past it has been necessary to deny the issuance of a license because of faulty construction or the lack of certain features necessary to maintain the plant in a sanitary condition. Under these circumstances, alterations become necessary and reinspections must be made occupying considerable time of our field staff.

Under the present setup reinspection before issuance of the license is rarely made. A better understanding of the problem and relationship of all concerned has been developed and each person has become acquainted with the other fellow's problem.

Another new law which becomes effective on September 1, 1948, not relating specifically to frozen desserts, warrants mention because frozen desserts are involved to a certain extent. On and after September 1, market

milk or the fluid derivatives thereof used in the preparation of milk shakes or other mixed drinks shall be dispensed and poured from standard milk bottles or single service containers which have been filled and sealed or capped in a milk products plant. This eliminates the so-called "milk pump" and the "dipping" of milk at places such as soda fountains.

I believe this is a step in the right direction and another step toward producing and maintaining high quality wholesome products.

The three pieces of new legislation just briefly mentioned would not be in effect were it not for the support of the dairy industry which again displays the desire to improve the quality of products and the conditions under which they are manufactured and handled.

FROZEN DESSERTS IN THE EASTERN STATES

DAVID LEVOWITZ

Director, New Jersey Dairy Laboratories, New Brunswick, New Jersey

1. *Freezers for Processing Purchased Mix*

In last year's report to the committee, it was noted that a definite trend was observed, in this area, to install ice cream freezers for processing purchased mixes. The trend has not abated, but rather increased in its tempo. Freezers–counter type, batch or continuous–have been purchased by more and more fluid milk processing plants, roadside stands, ice cream parlors, restaurants, and department stores.

The trend has been encouraged, directly, by the ever-growing popularity of homogenized fluid milk. Now that it possesses a homogenizer, the average fluid milk plant is in a position to manufacture ice cream mix. Installing an ice cream freezer next is not illogical. The next step is to expand the retail salesroom to a dairy bar, and then to establish a parking space for further dispensing capacity. Frozen desserts may be packaged in cartons for storage in most domestic refrigerators, and carried on regular milk distribution vehicles, in insulated containers. The route man can deliver a package of ice cream with the regular milk drop-off, or later in the day, on his bill collection rounds.

Since the fluid milk plants already served hotels, restaurants, ice cream parlors, and grocers with other items, to get their frozen desserts supply business was primarily a question of unit price—at least in the case of the smaller stops. The name of the local fluid milk plant is usually well established in a community; the good will engendered is an appreciable factor which is not being overlooked.

Most larger stops did not previously consider it practical to freeze products for their own use when mixes had to be ordered well in advance and from a distance. Many of these have now changed their policies and they now provide a market for mix from a neighboring fluid milk processing plant.

Another factor contributing to this trend is that smaller fluid milk plants recognize that manufacturing mix in limited quantities must result in a disproportionately high unit cost. Not to parallel the services offered by the larger plants is to lose caste; to overlook the frozen desserts sales is distressing. Many smaller milk plants have therefore also installed freezers, and developed dairy bars, parking lots, and route packages. Mix is purchased from either ice cream plants located at a distance or from locally competitive milk plants depending on price.

Manufacturing mix is seasonal at some of the fluid milk plants. These purchase mix from other milk or from ice cream plants, seasonally, to satisfy their commitments and own plant needs.

2. The Sanitation Control Problem

Figures subdividing frozen desserts gallonage according to the type of freezing operation—ice cream plant; fluid milk plant making its own mix; freezer operated on purchased mix, supplied from ice cream or milk plants, directly or indirectly—are not available. It would be quite a project to develop them. Judging from the signs displayed at the stops, and a knowledge of the plants whose products are identified, a substantial gallonage originates from other than exclusively frozen desserts operation.

The products which are manufactured by plants which deal solely with frozen desserts are marketed over the entire metropolitan area. The products from the others are distributed only rarely in the largest cities. The frozen desserts ordinances of these are far from uniform, but generally require much more than the fundamental installation facilities demand by the state codes. The smaller cities, towns, villages, etc., either recite in their codes that the state requirements must be satisfied, or say nothing at all—in which case those of the state still hold. No one can enter into frozen desserts manufacturing until his facilities are approved by the state division.

A general criticism of the programs of the larger cities is that they do not provide for the control of the entire range of frozen desserts. Samples are generally restricted to the vanilla and chocolate flavors of bulk ice cream. Examination of the flavor ice creams manufactured by the addition of materials at the freezer and fruit hopper, and of all of the novelty and packaged items is essential to learn what the consumer receives.

A most beneficial effect on frozen desserts sanitation was developed by the Federal system for purchasing these products for its installations. In addition to satisfying certain chemical standards, the frozen desserts were required to demonstrate their consistent absence of coliforms, yeasts, and molds in 1 milliliter portions. As a penalty for repeated non-compliance, suppliers were not compensated for defective merchandise and had to deliver fully satisfactory products for the balance of the contract period at the stipulated contract price but purchased from other agencies.

While the industry did not take kindly to these requirements at first, it recognized their justice. The Federal plan was to provide consistently safe, health-promoting, frozen desserts to its personnel. Research had established that coliforms were very definitely not heat resistant to the processing temperatures entailed in frozen-desserts manufacture. The same carelessness which attended inoculation with coliforms might be accompanied by the entrace of pathogens. The industry learned rapidly that the Federal requirements could be met if the plant operations were planned to avoid mishandling. Double-handling was also eliminated by planning and more satisfactory products were attained with less expenditure of effort than ever before.

The frozen desserts manufacturers established their own control systems to calibrate the characteristics of the mix ingredients they purchased as well as of the products they manufactured.

The Federal requirements curtailed the number of flavor ice creams frozen. The flavoring materials which were easily contaminated with yeasts and molds or had high coliforms or bacterial counts and which could not be heat treated successfully would prove too costly to use for Government products. Heat treating, followed by careful handling, was made routine on the entire equipment assembly following storage tanks as well as on the materials to be added to the pasteurized mix.

The Federal requirements did not result in increased cost to either the manufacturers or the government. A review of the contracts will show the frozen desserts bids were regularly let, at prices below the average market. The manufacturers did not enter the bidding to lose money.

The experiences of the Federal in-

stallations show that critical control of frozen desserts was achieved in a number of different markets. It resulted from clear-cut specifications and positive implementation. It encouraged — actually forced — systematizing plant processing, and careful training of operating plant personnel.

The major criticism of the situation created by the present influx of freezing units, as shown by the frozen desserts reaching consumers, is that too frequently, either the personnel is not trained adequately, or the plant operation is uncoordinated, or both.

We could well profit from the lesson taught by the Federal system for frozen desserts purchasing. Clear-cut specifications over an entire area, small or large, and identical impersonal implementation would bring about the consistently safe, health-promoting frozen desserts desired.

3. Mix Ingredients

We might begin "standardization" with a survey of the mix ingredients "approved" by the various states. Nutritionally, butter fat and casein, derived from butter oil or "rennet curd" are identical to those from fluid milk. In some states, the reasoning has been put forth that the housewife would not employ concentrates in making a frozen dessert from a standard recipe.

If the recipes of a hundred years ago are reviewed, the housewife would use only milk and cream as sources of dairy solids; condensed and powdered milks could not be included before they were available. By disapproving the recently developed concentrates from frozen desserts manufacture, these valuable nutrients are forced into non-human utilization, or completely wasted. The ultimate effect is to make frozen desserts more costly.

"Rennet curd" can be made readily, even at small plants, during flush season. Casein is the most valuable of all the proteins—because of its high tryptophane content. Extra casein would be highly desirable in frozen desserts. The casein levels in ice creams made with the usual whole and skim milk concentrates are limited by the attendant lactose. This causes "sandiness" when it crystallizes out of supersaturated solution. Instead of dumping skim milk and developing effluent problems, the curd would be much more beneficial if utilized as food. In some states plastic cream, butter, and butter oil are banned because they "may have been made from inferior milk or cream." To define "inferior" — would it not be fairer to "approve" products on the results of examination? Milks and creams—even from plants whose physical facilities are excellent — may not always be satisfactory. Properly prepared fat concentrates will prove to be at least as satisfactory—to understate.

We could start our standardization with the approval of products demonstrated to be "sound"—which would require the manufacturer to "control" his daily operation—rather than to consider that he has satisfied sanitary requirements by installing so many sheets of stainless steel, and so many tons of tile. And good buttermilk powder would be just as acceptable as good milk powder. (From the ice cream manufacturing aspect, the buttermilk powder possesses advantages.)

The consumer has a right to select what he purchases and a right to be informed as to composition, to guide his choice. Labelling should be standardized, too, to identify ingredients as well as chemical constitution.

What about the minimum permissible fat content? The range, now, from the various state laws, is from 6 to 14 percent. Let us take 10 percent, the average. It will not make ice cream so expensive as to remove it from the diet of the poorest economic group.

Only one of the states defines a minimal non-fat dairy solids percentage. Since casein is the most important serum nutrient, but since casein percentage may be limited by the choice of other ingredients, a protein-fat ratio should be defined. Protein is more

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REPORT OF THE COMMITTEE ON ORDINANCES AND REGULATIONS *

DURING the past year, this committee has made available to each member a copy of its 1947–1948 report which included a proposed ordinance relating to the production, handling, and processing of milk.

Due to circumstances beyond the control of either the committee or the association, it was not possible to do this until late this year. Up to the present time, over fifty members have submitted to the committee their opinions, criticisms, and recommendations for changes in specific items. The total number of recommendations for changes tabulated to date (Oct. 19, 1948) is 110. These relate to 44 different items. Additional recommendations are being received daily. Obviously, the committee has not had the opportunity to study and appraise these recommendations. To act without such appraisal would be in effect, discarding valuable and pertinent material. Hence, a final report cannot be submitted at this meeting.

Opinions and specific recommendations have been and will continue to be of exceptional value and assistance to the committee. We wish to express our sincere appreciation to those members who have given much time to and careful thought and study of the committee's report.

A preliminary study of membership opinion indicates that it is the hope and belief that an ordinance can be developed and adopted by the Association; and that when it is, it will prove to be a useful tool in the hands of sanitarians in their work to improve milk sanitation generally.

It is the recommendation of the committee that:

(1) the committee on ordinances and regulations be continued;

(2) recommendations should be received by the committee for consideration not after January 15, 1949;

(3) a report be submitted to the Association for final action at its 1949 annual meeting;

(4) this committee or a similar one be made permanent in the event that the Association adopts an ordinance. Such committee should have the responsibility of making further recommendations for amendments which might be deemed necessary and desirable in view of changing conditions and future developments in the industry and in methods of control.

C. S. LEETE, *Chairman*,
C. A. ABELE,
C. J. BABCOCK,
H. L. DE LOZIER,
H. J. DUNSMORE,
A. W. FUCHS,
O. A. GHIGGOILE.

* Presented at the Thirty-fifth Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., Philadelphia, Pa., Oct. 21, 1948.

Dairy Technology at Temple University

A two-year course in Dairy Technology leading to the degree of Associate in Technology will be offered by the Community College of Temple University in September, it was announced by Harry C. Rountree, dean of the Community College and Technical Institute.

A balanced and comprehensive curriculum dealing with practical dairy problems and techniques has been arranged, with the view toward making present dairy employees far more valuable to their employer, and to provide competent trained personnel for the dairy industry as a whole.

The course will prepare students for such positions as dairy plant foreman, dairy products salesman, dairy and health inspector, etc. The two-year Community College program will also include thorough training in the manufacture of ice cream.

REPORT OF THE COMMITTEE ON SANITARY PROCEDURE *

THE accomplishments of the Committee on Sanitary Procedure, since the Milwaukee Meeting, include consideration and approval of:

Sanitary Standards for Homogenizers and High Pressure Pumps of the Plunger Type.

Designs and Dimensions of the Following-Named Milk Piping Fittings.

These fitting designs had been approved some years ago, but have been slightly revised to reduce the damage to gaskets, and the dimensions have been revised and tolerances reduced so as to make the fittings of the various manufacturers interchangeable.

Bends, 2-C, 2-CG, 2-F, 2-FG, 2-K, 2-KG, 2-P, and 2-PG
Tees, 7, 7-G, 7-A, 7-AG, 7-B, and 7-BG
Crosses, 9 and 9-G
Valves, 10-C, 10-CG, 10-BF, 10-BFG, 11-C, and 11-CG
Nut, 13-H
Ferrules, 14-R, 14-RG, 15-R, and 15-RG
Caps, 16-A and 16-AG
Angle Valves, 30-F and 30-FG
Reducers, 31-15, 31-15-G, 32-15, and 32-15-G
Can Fillers, 33-F and 33-FG

Amendment of Section D-7 of the Sanitary Standards for Storage Tanks for Milk and Milk Products, to substitute designs and dimensions of interior thermometer wells for the 3-A Thermometer Fittings therein prescribed. (The latter, because of their fragility, are not suitable for installation in storage tanks, wherein unprotected thermometer bulbs are exposed to damage). It is agreed that sanitary standards for exterior thermometer wells (tank-wall blisters) shall be evolved and incorporated into the Storage Tank Sanitary Standards at an early date. The new type of construction eliminates the necessity for daily removal of the thermometer for cleaning, with attendant hazards.

The Committee formally took these actions on Wednesday after canvassing ballots filed by mail. The notification of the Dairy Industry Committee of this action, and the publication of these sanitary standards (presuming acceptance by the Dairy Industry Committee), will follow in due course.

During the interval since the last Annual Meeting the Committee has had under consideration tentative sanitary standards for milking machines, can-washers, milk transportation tanks, dairy ware (milking pails and strainers), electric motors, and milk filters using disposable filter media. Complete agreement has not been reached with respect to all of the details of sanitary standards for the types of equipment enumerated, and revised sanitary standards are now being formulated by the several task committees of the Subcommittee on Sanitary Standards of the Dairy Industry Committee.

Two joint-meetings with the other agencies involved in the formulation of 3-A Sanitary Standards have been held during the past year. One of these was held in this city Wednesday. The other, held at Cambridge Springs, Pennsylvania, on August 11 and 12, 1948, occupied two full days (and the evening of the first) in intensive discussion and deliberation. Subcommittees carried on discussions and formulated recommendations around luncheon or dinner tables, to conserve time.

Respecting the study of HTST pasteurization timing, which, as reported at Milwaukee, has been conducted at Cornell University, and has been supported by funds made available by the National Sanitation Foundation, and which was initiated as a project by a subcommittee of this Committee, under the chairmanship of C. W. Weber:

* Presented at Thirty-fifth Annual Meeting of the INTERNTIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., Philadelphia, October 22, 1948.

Drs. William Jordan and R. E. Holland are presenting a report of the study findings, and a tentative draft of a procedure for timing this type of pasteurizing equipment has been submitted to the full Committee for consideration.

In order to advance that end, the Committee recommends that the Affiliated Associations and Societies be encouraged to appoint local committees on Sanitary Standards. The functions of such committees might well be:

(a) To assist in the distribution of reprints of the published Sanitary Standards, so that a complete coverage of sanitarians and of users of the equipment is effected. It is essential that knowledge of these standards become wide-spread if the program is to be successful.

(b) To transmit to the Committee on Sanitary Procedure suggestions for details to be incorporated into sanitary standards under consideration, or to recommend amendments to the standards as the necessity therefor develops.

(c) To follow-up on the use of the 3-A symbol after it has been registered and comes into use.

(d) To constitute a pool of interested and active personnel from which to select replacements for the membership of the Committee on Sanitary Procedure, as the need arises.

All affiliated associations are urged to provide in meeting programs for discussions of the sanitary standards and the work of the Committee on Sanitary Procedure. Committee members, within reach of such meetings will accept invitations to discuss these subjects at such meetings.

Negotiations for the registration of a 3-A symbol, discussed in the last two preceding Reports of this Committee, are not sufficiently advanced to warrant further discussion at this time. It is to be noted, however, that several equipment manufacturers currently carry in advertising texts the statement that their products presented conform to 3-A Sanitary Standards.

Plans for publication and dissemination of 3-A Sanitary Standards are being developed at this Meeting.

The foregoing items of this Report pertain to the action of your Committee since the Milwaukee Meeting. This Report would be incomplete did it not include recommendations to the Association membership concerning the manner in which published 3-A Sanitary Standards may best be employed.

In the normal course of events, the adoption and publication of sanitary standards for a specific type of equipment is not automatically followed—at least not immediately—by the manufacture or fabrication only of equipment which conforms to those standards. All manufacturers have not participated in the formulation of the standards; some are not in complete accord with all of their provisions; and none are compelled by agreement to make any equipment conforming to these standards. It is well to bear in mind that the construction of equipment conforming to 3-A Sanitary Standards is not mandatory, and that the publication of such standards will not automatically limit production to equipment fully conforming to those standards. It may be assumed that the inventory of most manufacturers includes numbers of assembled units, or parts, of equipment which antedate standards, irrespective of the date of their publication. Even in the case of equipment which is custom-fabricated to dimensions provided by each purchaser, patterns, dies, jigs, and toolings antedating the adoption of the standards must be employed until new ones can be placed in service. Consequently, an indeterminate interval may be expected to elapse before even a respectable proportion (except in the case of piping fittings) of equipment of a type covered by standards conforms to those standards.

Therefore, it is imperative that purchasers of equipment, desiring that it conform to 3-A Sanitary Standards, definitely specify in their orders that

it do so. Members of this Association should be diligent in calling this situation to the attention of prospective buyers of equipment, even though the interval until delivery may be extended thereby to some degree.

Your Committee finds itself in the difficult position of urging Association members to avail themselves of the advantages of 3-A Sanitary Standards, while it simultaneously deems it advisable to caution them against outrunning the program in which it is engaged.

The Committee has learned of instances in which, it having become known that sanitary standards for a certain type of equipment were being formulated, the purchase of equipment of that type, of the then current design, was discouraged—or even prevented—for reasons which may readily be surmised.

Your Committee is concerned lest misdirected enthusiasm in support of the 3-A Sanitary Standards retard—or even, as can be envisioned, completely halt—the whole program in which it is engaged, because of the reluctance of manufacturers to subject themselves to such restraints in sales as have been described, for indeterminate periods beginning as soon as it is learned that sanitary standards for a particular type of equipment are being formulated. Sanitary Standards can not be formulated in complete secrecy; the wisdom of doing so would be questionable, if it were possible.

It is urged, therefore, that 3-A Sanitary Standards, when published, be accepted in the nature in which they are intended: As a guide to manufacturers and as criteria for milk sanitarians and buyers, *effective from the date of publication.* It is further urged that tentative sanitary standards, still under consideration, be considered to be non-existent with respect to equipment currently in use or being marketed. It is only through such a degree of cooperation among all concerned that the full advantages of this extensive program can be realized.

C. A. ABELE, *Chairman.*

Frozen Desserts

(Continued from page 298)

expensive than low-sweetening sugars. A dairy protein requirement would discourage low-protein-high sugar solids mixes.

Research has developed chemical entities which possess extraordinary abilities to "stabilize" frozen desserts. If these materials satisfy the requirements of the Federal agencies with regard to non-toxicity, I see no reason not to include them with the already "approved" stabilizers, and subject to identical limitations.

With reference to microbiological standards, the Federal levels, reviewed earlier, have demonstrated themselves to be ample. They would control processing. The plant which manufactures frozen desserts exclusively, and the small roadside stand with the counter freezer, would both have to demonstrate, through their products, that they subscribe regularly to sanitary practise.

In the last year report, it was suggested that uniform specifications be adopted by adjacent states. Nothing has yet been accomplished at this level. But a number of adjacent municipalities, in this area, have recently instituted such a program for all dairy products control. While the system has been in operation for only a few months, the favorable reaction and cooperation from both large and small manufacturers has been most encouraging.

F. W. FABIAN, *Chairman*
W. C. CAMERON
O. A. GHIGGOILE
R. E. IRWIN
DAVID LEVOWITZ
J. M. SCOTT

NATIONAL RESEARCH COUNCIL MILK QUALITY AND MILK REGULATIONS

A study of the effect of health and sanitary regulations upon milk quality is being undertaken by the National Research Council under a contract with the U. S. Department of Agriculture, financed by the Research and Marketing Act.

Market milk and its products must conform to various statutes, ordinances, and regulations adopted and administered by local, state, and Federal authorities for the purpose of protecting public health. Such regulations are applicable to production, processing, and distribution and are designed to insure the maintenance of various safety, nutritional, and esthetic properties of milk and its products. They may differ widely in requirements and differ also with respect to administrative interpretation and enforcement practices.

The purpose of the present study is to determine precisely what requirements are being enforced in representative jurisdictions and how the requirements affect the quality of milk delivered to the consumer. In this study the term milk is considered to include market milk and such milk products as cream and skim milk for fluid use and for use in the manufacture of ice cream.

It is planned, initially, to study municipalities with populations between 100,000 and 500,000 and the states within which these cities are situated. Statutes, ordinances, and regulations will be compiled in order to determine the range of variation of actual requirements in force and select typical jurisdictions for intensive field study, including associated administrative and enforcement procedure. The effect of regulations upon quality will be investigated through laboratory and other research methods.

The study will be conducted under the supervision of a committee operating jointly under the Food and Nutrition Board and the Agricultural Board of the Division of Biology and Agriculture of the National Research Council. The membership of this committee includes qualified personnel from the fields of dairy technology, economics and production, and also the field of public health. W. E. Krauss, Associate Director of the Ohio Agricultural Experiment Station, is chairman, and the members are C. J. Babcock, USDA; R. K. Froker, University of Wisconsin; A. W. Fuchs, USPHS; C. G. McBride, Ohio State University; Leland C. Spencer, Cornell University; W. D. Tiedeman, New York State Department of Health; G. M. Trout, Michigan State College, and W. A. Wentworth, The Borden Company. Arthur C. Dahlberg, Ph.D., Professor of Dairy Industry at Cornell University, has been engaged as the director of the study.

The National Research Council is conducting the project as the operating agency for the National Academy of Sciences.

NEW BOOKS AND OTHER PUBLICATIONS

Food Products, by H. C. Sherman. 4th edition. Published by the Macmillan Company, New York, 428 pages. 1948. $3.90.

Since the date of the 3rd revision (1933) of this excellent book, developments in the food industry have been great. This new edition brings the subject up to date. His general style is like that of the preceding edition wherein each chapter deals with: (1) food production, preparation, and marketing; (2) sanitation and quality control; (3) composition; and (4) nutritive and dietary value. The text has been largely rewritten and the extensive "References and Suggested Readings" at the ends of the chapters have been re-selected so that most of them date since the 1940's, many as late as 1946, and some in 1947. The author states that "special attention has been given to a carefully studied revision of the tabulations of the amounts of individual amino acids in the different food proteins. . . . The latter (suggested readings) are intended to be comprehensive enough to facilitate extension of the study along chemical, economic, nutritional, sanitary, or technological lines, as the individual reader may desire."

The book is about one-fifth smaller than the earlier editions. Much space was saved by eliminating some tables, maps, illustrations, and the printing of legal requirements. New material is added in the pecuniary economy of using the various foods in the diet. It is a storehouse of much useful information for the general reader, student, or more advanced worker in the field who can find the wanted food information here.

Condensed Milk and Milk Powder. By O. F. Hunziker. 7th edition. Published by the author, La Grange, Illinois. 583 pages. 74 tables. 143 figures. 1949. $7.00.

This new edition follows the general format of the previous editions (1914, 1918, 1920, 1926, 1935, 1946) with the addition of new material which the author has found to be useful and dependable. Every department contains new information on products, equipment, processing, and packaging. Many plants were visited in this country and Europe, and contacts were made with leading manufacturers in the important dairy countries in order to make this new edition useful.

The Canned Food Reference Manual. A publication of the Research Division, American Can Co. 3rd edition. American Can Company, 230 Park Ave., New York 17, N. Y. 638 pages. 1947.

This is a revision and enlargement of the two previous editions which appeared in 1939 and 1943. It contains much new material on canned foods, and is arranged as a good reference text with many supporting references to the literature. It carries the "Accepted" seal of the American Medical Association. Throughout the text, 119 illustrations usefully embellish the narrative, and in the Appendix 36 tables list a wide variety of useful facts. The book is authoritative and excellently informative on the subject of canned food, interestingly readable, and a convenient source of information for laymen, industrialists, and teachers.

DISI Issues Handbooks on Dairy Industry

Seven basic handbooks, covering important phases in the production, processing, and distribution of fluid milk and in the processing of other dairy products have been released by Dairy Industries Society, International (DISI). Prepared by the Publications Subcommittee of the Technical Advisory Committee of DISI, and written in English, the booklets describe in simple form effective methods and facilities, and types of supplies and equipment available for these operations.

Sanitation in Dairy Farming—The booklet describes in detail, management, handling, health, and feeding of dairy cows; proper milking procedures for optimum productivity; sanitation in the barn; methods for combating pests and precautions for prevention of their breeding; proper cleansing of utensils; and care of milk after milking.

Farm Cooling of Milk—Although the handbook gives recognition to more elementary methods, it emphasizes highly modern procedures, describing in particular the use of mechanically refrigerated surface coolers. Other methods of cooling with less elaborate equipment are also outlined.

Sanitation in Dairy Processing—The text covers thoroughly cleaning materials, and describes step-by-step methods of cleaning all plant equipment including vats, heat exchanger units, churns, milk cans, etc. Instructions for washing by hand or by machine are given in detail.

Separation and Clarification—Different types of clarifiers and separators, their uses, their advantages and disadvantages, their capacities and manner of operation are expounded.

Pasteurization of Milk—The booklet recounts the operations in the holding or batch methods, and the high-temperature short-time procedure, itemizing the machinery used and describing the heating and cooling equipment.

Packaging and Closures—The use of light-weight glass bottles, applied color, square designs, and all the major types of paper containers are described, and the results of surveys regarding their sanitary and practical aspects are discussed. Information on bottle caps, closures for paper containers, and filling and capping procedures are also particularized.

Milk Transportation—The development of hauling from farms to local receiving stations, long distance hauling from receiving stations to city terminal plants, direct hauling from farms to city terminal plants, and wholesale and retail delivery is recounted in such a manner that countries handicapped at present by technological factors may be aided in their planning for the future by becoming aware of trends revealed in the experience of at least one other country.

DISI will furnish further information about the handbooks to inquirers. Copies can be obtained at a nominal charge, by writing to Dairy Industries Society, International, 1426 G Street, N.W., Washington 5, D. C.

New Fall Courses in Food Technology

The Illinois Institute of Technology announces two 16-week lecture courses in the graduate field: "Food Acceptability Techniques" and "Food Regulation and Compliance", running one lecture per week from September 21 through January 25, 1950. Circulars may be obtained from The Graduate School, Illinois Institute of Technology, Chicago 16, Illinois.

The University of Illinois offers three courses, each class of which is limited to 30 students, held on Fridays, September 23 through February 3, 1950, as follows: "Dairy Engineering" (Dr. P. H. Tracy, in charge), "Dairy Salesmanship", and "Defects in Dairy Products and Their Control." Write T. H. Dekker, Extension Specialist, Division of University Extension, Illini Center, La Salle Hotel, Chicago 2, Illinois.

JOURNAL of MILK and FOOD TECHNOLOGY

(including MILK AND FOOD SANITATION)

Official Publication of the

International Association of Milk and Food Sanitarians

(Association Organized 1911)

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Membership and Dues: Active membership in the Association is $3.00 per year, and Associate membership is $2.00 per year, including respectively all issues of the JOURNAL OF MILK AND FOOD TECHNOLOGY (including MILK AND FOOD SANITATION). All correspondence concerning membership in the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, including applications for membership, remittances for dues, failure to receive copies of the JOURNAL OF MILK AND FOOD TECHNOLOGY, and other such matters should be addressed to the Secretary of the Association, George A. West, 44 Marshall St., Rochester 2, N. Y.

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ASSOCIATION NEWS

Loomis Burrell Elected Member Scientific Research Society of America

Loomis Burrell, Chairman of the Board of Directors of Cherry-Burrell Corporation, was recently notified of his election to membership in the Scientific Research Society of America. Membership in the society, which is allied with the honorary science fraternity, Sigma Xi, is limited to individuals with scientific training not engaged in educational work, who have done outstanding research in industry.

Mr. Burrell is a distinguished graduate of Yale University and an outstanding dairy scientist. He has been engaged in various development projects designed to improve sanitation methods and processes in the dairy industry since joining D. H. Burrell & Co., a predecessor of Cherry-Burrell, 53 years ago. Mr. Burrell has several inventions and patents to his credit. During recent years he has devoted a great deal of time to working with authorities in the public health and sanitation fields.

Rowland Succeeds Carl on Professional Status Committee

Mr. J. L. Rowland, Department of Public Health and Welfare, Jefferson City, Mo., has been appointed a member of the Committee on Professional Status of Sanitarians for the year 1949, under the Chairmanship of Mr. Harold B. Robinson. This appointment is made to fill the vacancy caused by the resignation of Mr. Charles E. Carl who was unable to continue the membership.

Wisconsin Dairy Short Course

The Department of Dairy Industry, University of Wisconsin, will offer a Dairy Short Course, beginning September 26 and closing on December 17, 1949.

Students taking this course may take either ice-cream making and market milk, or butter making and cheese making. In addition to these subjects, students will be given instruction in dairy arithmetic, dairy bacteriology, dairy cattle diseases, dairy mechanics, dairy sanitation, marketing dairy prod-

ucts, and milk composition and tests. Since the War, it has not been possible to enroll non-resident students, but this year a limited number can be accepted.

Information can be secured by writing to Professor H. C. Jackson, Department of Dairy Industry, University of Wisconsin, Madison, Wisconsin.

Standardization of Food Equipment

A committee composed of representatives from organizations in the field of sanitation has been set up under the auspices of the National Sanitation Foundation to establish standards in food equipment. It is an outgrowth of the good work that has been under way by the Committee on Sanitary Procedure of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., dealing with dairy equipment. Groups which participated in organizing the committee are: Engineering Section, American Public Health Association; U. S. Public Health Service; National Association of Sanitarians; Conference of Municipal Public Health Engineers; Conference of State Sanitary Engineers; and INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC. Mr. C. W. Weber, of Albany, N. Y., is the Chairman.

The Committee will meet with representatives of the industries. Standards set will be used by the Foundation in its testing laboratory and will serve as guides to the manufacturers of food equipment for the manufacture of equipment that embodies the best known sanitary practise.

Greenbank Receives Borden Award

Dr. George R. Greenbank, research chemist in the Bureau of Dairy Industry, U. S. Department of Agriculture, will receive the Borden Award in the Chemistry of Milk for his work in improving powdered milk. In addition to the gift of $1,000, the Borden Award includes a gold medal, both financed by the Borden Foundation and administered by the American Chemical Society.

Announcement of Regular Corps Examination for Sanitarians (Nutritionist) United States Public Health Service

A competitive examination for appointment of Sanitarians (Nutritionist) in the Regular Corps of the United States Public Health Service will be held on November 14, 15, and 16, 1949. Applications must be received *no later than October 17.*

Requirements:

United States citizenship
At least 21 years of age
The Bachelor's Degree with a major in home economics, foods and nutrition, or dietetics
The Master's Degree with a major in nutrition from a school of recognized standing
Successful completion of a hospital dietetic internship approved by the American Dietetic Association
At least ten years of educational training and professional experience subsequent to high school

The written professional examination will include the following subjects: group feeding, public health methods, general sanitation and hygiene, general and food chemistry, and nutrition in health and disease.

Entrance pay for a Senior Assistant without dependents is $4053.50; with dependents, $4489. These figures include subsistence and rental allowance.

Application forms and additional information may be obtained by writing to the Surgeon General, United States Public Health Service, Washington 25, D. C.

Attention: Division of Commissioned Officers. *Applications received after October 17, 1949, will not be accepted.*

PRELIMINARY PROGRAM

36th Annual Meeting, INTERNATIONAL ASSOCIATION OF MILK & FOOD SANITARIANS, INC.

Deshler-Wallick Hotel, Columbus, Ohio, October 20, 21, 22, 1949

October 19th and 20th, Registration fee, $1.00
Official Welcome—Hon. James A. Rhodes, Mayor of Columbus
Opening Address—Dr. A. B. Kurlander, Ohio Department of Health
Frozen Food Locker Program in Indiana—Mr. John Taylor, Indiana State Dept. of Health
Food Handler Training Problems—Dr. W. H. Haskell, Klenzade Products
Food and Dairy Inspection Program in Ohio
Field Trips: A Modern Beverage Plant (Coca Cola Beverage Co.)
A Modern Milk Plant (Borden's Moores & Ross)
A Modern Laundry (New $35,000 establishment)
A Modern Restaurant (Mill's)
The Nationwide Sanitation Program—Mr. W. F. Snyder, Exec. Dir., Nat. San. Foundation
Round Table Consideration of Report of Committee on Sanitary Procedure—Mr. C. A. Abele, *Chairman*
High Temperature—Short Time Pasteurization of Ice Cream Mix—Mr. M. L. Speck, University of North Carolina
Round Table Consideration of Report of Committee on Applied Laboratory Methods—Dr. L. A. Black, *Chairman*
The Use of Detergent-Sanitizers on the Dairy Farm—Mr. J. Meany, Chicago Health Dept.
Thermal Death Time Studies of Coliform Bacteria in Milk—Dr. J. C. Olsen, University of Minnesota
Soaker Type Milk Bottle Washers—Dr. R. F. Holland and Dr. C. N. Stark, Cornell University
Technical Aspects of Milk Plant Inspection—Mr. J. A. Dotter and Mr. E. A. Graber, Ohio State Department of Health
Annual Business Meeting
Annual Banquet and Entertainment
Round Table Consideration of Report of Committee on Dairy Farm Methods—Dr. R. G. Ross, *Chairman*
What to Look For in Bakery Sanitation Appraisal—Mr. E. L. Holmes, Amer. Inst. Baking
Loose Pen Housing for Dairy Cattle—Mr. S. Witzel, University of Wisconsin
D D T and Related Insecticides in Milk—Dr. E. F. Knipling, U. S. Dept. Agr.
Pest Control and Food Sanitation—Dr. R. E. Evans, Commonwealth Sanitation Co.

NATIONAL SANITATION CONFERENCE

A sanitation conference of national scope was held under the auspices of the National Sanitation Foundation, at Ann Arbor, Michigan, June 14–15, to consider the need and the means of further development of sanitation in the national life. Representatives were present from twenty-eight national organizations working in the fields of public health, safety, education, industrial hygiene, medicine, nursing, engineering, sanitation, and housing, with a registration of seventy-five or more.

On the first day, formal addresses brought out the following ideas:

Dr. Haven Emerson pointed out that the public takes for granted that proper safety and cleanliness and sanitation will be provided them without their realizing that these services are based

on involved preparatory and surrounding technologies. He deplored selfish commercial interests and the "biological illiteracy" of the public. However, he believed that persistent and proper education will broaden the public consciousness and give the support necessary to advance the practise.

Dr. Mark Hollis, Assistant Surgeon General, U. S. Public Health Service, wants the public to become more interested and participant in providing a healthful environment. With sanitation stressed as important in fundamental health department practise, there is need for further progress in translating relatively safe environment to one which will provide more safety along with aesthetic enjoyment. This requires public education, support, and action by men in sanitation science.

Mr. Walter F. Snyder, executive director of the National Sanitation Foundation, said that sanitation is a philosophy, something that must come from within the people, thus being everybody's business. This must be done by education, starting in the home, reaching out to the man in the street, and applied by business and commerce. He listed seven areas needing sanitation development: trained personnel, research, education, a clinic for industry to meet public health, a testing laboratory, publication of an authoritative journal covering general sanitation, and textbooks.

Dr. Nathan Sinai, vice-president of the Foundation, stressed sanitation as a way of life, involving the whole environment, calling for action by everyone participating.

The conference then organized into three discussion groups which examined the field in more detail, and reported back to the general session. The current accomplishments in sanitary engineering, disease control, and environmental hygiene were highly commended as representing much progress in improving the general situation in the life of the people. It expressed itself that sanitation had a broader field in that it should encompass all phases of environmental problems including physical, psychological, social, and moral ones. Such a broadening would require the sharing of problems encountered by sanitation personnel with the school, the community lay organizations, and the public at large. Present official organizations must continue as essential fundamental parts of the overall program. There is a need for a non-official agency, such as the National Sanitation Foundation, to show where and how sanitation can be further and better developed. The facts of research, the avenues of education, the interest of civic groups, the programs of official agencies should all be coordinated to eliminate conflicting emphasis and some confusion, and to support a stronger sanitation emphasis on the importance of making the public to be sanitation-minded.

The Foundation has expressed the meaning and significance of sanitation in a motto, as follows:

> Sanitation is a way of life. It is the quality of living that is expressed in the clean home, the clean farm, the clean business and industry, the clean neighborhood, the clean community. Being a way of life it must come from within the people; it is nourished by knowledge and grows as an obligation and an ideal in human relations.

The following resolutions were adopted:

> WHEREAS, Sanitation is a way of life as exemplified by the clean home, the clean farm, the clean business and industry, the clean neighborhood, and the clean community; and
>
> WHEREAS, Sanitation, as a way of life and in addition to its accepted health benefits, contains social, economic, psychologic and moral values; and
>
> WHEREAS, The full benefits of sanitation may be obtained only through the continuing and joint efforts of all individuals, families and organized groups that comprise the total community.
>
> THEREFORE, BE IT RESOLVED as follows:
>
> 1. That an expanded sanitation program on a nation-wide basis is needed and should be developed as soon as possible; and
>
> 2. That the National Sanitation Foundation, in collaboration with official and voluntary organizations and agencies, be urged to stimulate and further develop such a nation-wide sanitation program; and
>
> 3. That the first efforts be directed toward the development of community-wide educational programs, and that special emphasis be placed on individual and group participation.

INDUSTRIAL NOTES

ASSEMBLY OF OAKITE FIELD TESTING EQUIPMENT

Lawrence New Secretary IFT

Colonel Charles S. Lawrence, who retires from the Army on September 30, 1949, has been appointed Executive Secretary of the Institute of Food Technologists and Business Manager of *Food Technology*, the official organ of that society. Colonel Lawrence takes office October 1 and will be located at 222 West Adams Street, Chicago, national headquarters of IFT. Dr. Carl R. Fellers, an Associate Editor of this JOURNAL, is President.

"Rapid Milking" Reprints Available Free to Milk Plant Operators

A useful and informative article, "Rapid Milking" by Dr. W. H. Haskell, Klenzade Products, Inc., Beloit, Wisconsin, currently appearing in a number of dairy farm papers, is available free in reprint form to milk plant operators for distribution to their patrons. The article is a non-technical discussion of the necessity for proper timing dictated by the normal physiological functions of the cow as they occur during the milking operation. So-called "rapid" milking is based upon the duration of the hormone reaction following stimulation of the udder. The hormone reaction is usually established about one minute after the careful washing of the udder and continues for about six or seven minutes. Suggestions on how to stimulate the flow of milk and to complete the milking operation in the shortest possible time are the chief objectives of the discussion.

Milk plant operators are invited to write to Klenzade Products, Inc., Beloit, Wisconsin, for as many copies as they can use to help their patrons improve milking procedures and the quality of their milk.

Dr. J. C. Mauer formerly with the Rieck-McJunkin Dairy Company, Pittsburgh, is business manager of the laboratories.

Dr. Arnold H. Johnson has been appointed director of the research work of National Dairy Products Corporation at the Company's Oakdale, Long Island, laboratories.

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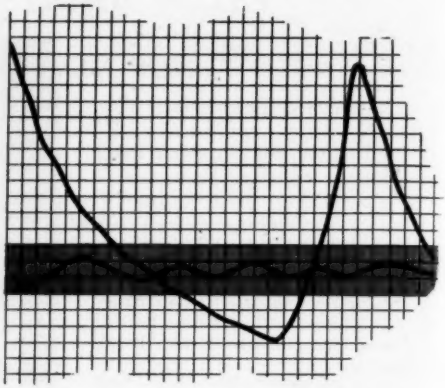
The Jamieson Kit—A Correction

An error has been discovered in the article entitled, "The Jamieson Kit—Its Construction and Use," by E. C. Chamberlayne, published in this JOURNAL, **11**, 301–309 (Sept.–Oct. 1948). The amounts of tryptone and beef extract were interchanged in the original manuscript. Correctly, the tryptone should be 5 gms. and beef extract 3 gms.

Dr. Jamieson expresses his regret at the delay in discovering and correcting the error. He points out that all tests by Dr. Chamberlayne and himself have been carried out on Difco tryptone-glucose-extract-milk agar as a base. To this was added 0.4 percent yeast extract and an additional 1.0 percent agar. However, check tests using the medium as outlined in the text of the paper and the medium as it should have been give essentially the same results.

You have to travel a narrow path to thorough and economical CAN WASHING

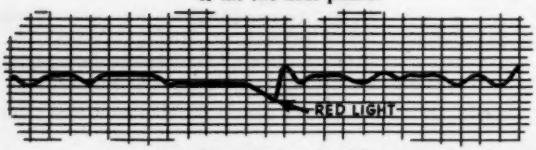


Precise control of the strength of your can washing solution is necessary for effective and economical can washing.

If the solution is too strong, you are wasting your cleanser; if it is too weak, your cans are not being thoroughly cleaned.

The solid line on the graph at the top of this page shows how precisely the Calgonite Electronic Control Unit maintains the alkali concentration in a can washing solution. Throughout the two hour test period, the Calgonite unit maintained the solution within prescribed limits.

The dotted line shows the performance of another type of control unit, tested at the same time, in the same dairy, in an identical can washer. Here the concentration was too high for approximately 48 minutes of the period, too low for 44 minutes. Concentration was within the proper limits for only 28 minutes of the two hour period!



Similar results of a Calgonite Control Unit test over a two hour period in a Pennsylvania milk plant are shown in the graph at the left.

In this operation the concentration in the can washer dropped when the Calgonite in the mixing tank of the control was exhausted half way through the run. The red light on the Calgonite Control Unit immediately signalled the operator, additional Calgonite was added to the mixing tank, and within a minute the solution was again at the desired point where it stayed for the rest of the test period.

The Calgonite Electronic Control Unit, plus Calgonite*—the complete cleanser, will, we believe, be the answer to your can washing problem. May we send you full information?

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